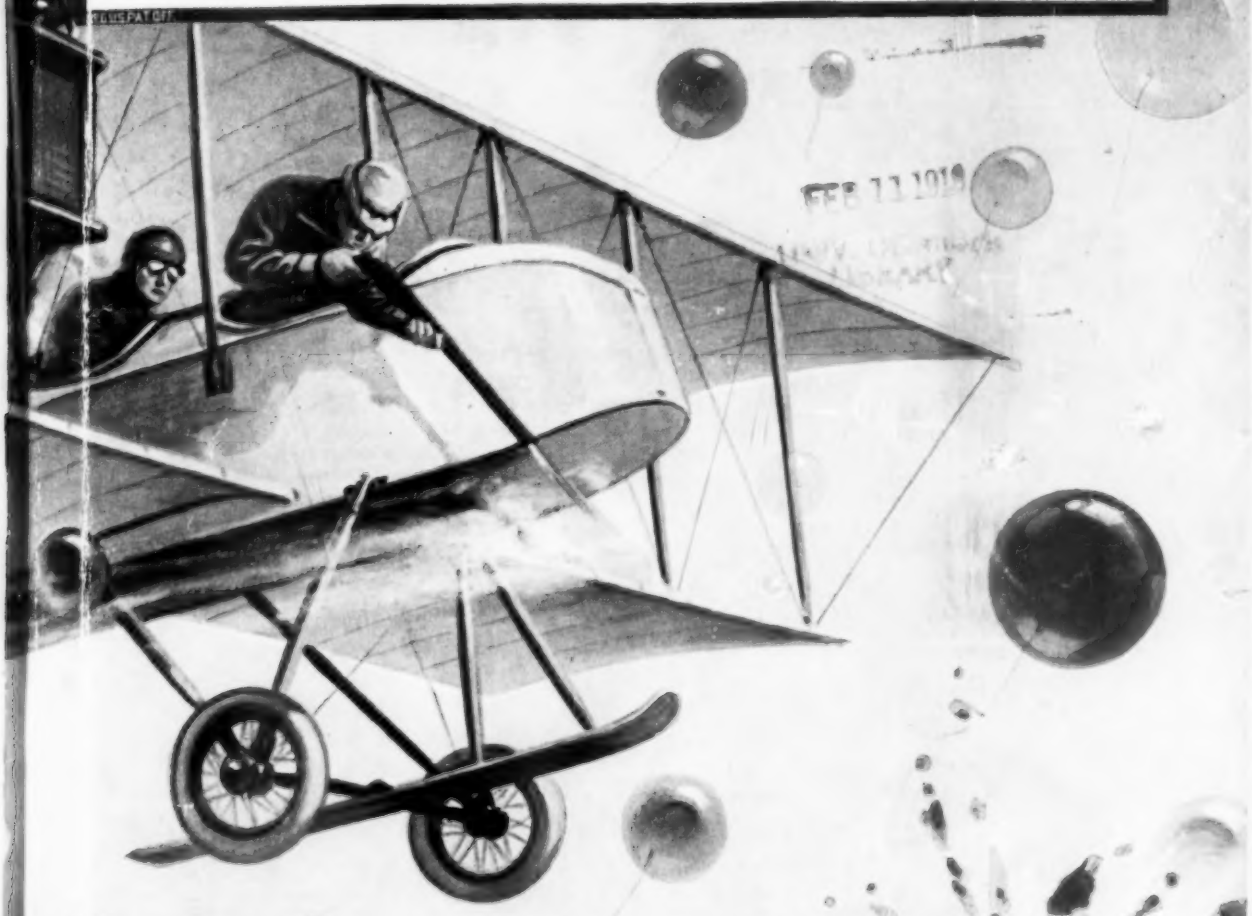
March 15 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



FEB 11 1919

See Page 353

HARRIS HOMES

$866
Buys the Material To Build This Beautiful Home No. HD426
Others as Low as
$350

No. HD434, $803

No. HD109, $715

No. HD89, $1,547

Build The Harris Way—

and secure the **utmost possible** in Quality, Economy and Service. Profit directly—**immediately**—by our 24 years' experience. Get the benefit of our practical knowledge FREE.

"The Harris Way" Has exclusive merits—special advantages for the shrewd and careful Home Builder, possessed by no other plan or method. It is the best, safest and most sensible way to build your ideal home **right** without sacrifice of quality **or the waste of a single penny!** Thousands have built "THE HARRIS WAY" with profit.

$10,000,000 Capital Stock and Surplus
Stands back of our guarantee to Every Harris Home Buyer—you cannot lose.

Advance in Prices Our prices are so low that it will be impossible to maintain same for any length of time. They are bound to advance. If you are needing a house, either for investment purposes or for a home, write now. Do not delay another moment if you wish to make a saving.

The Material Used in building all Harris Homes is prepared by us complete for your use in a way that is instantly and easily understood. It means **absolute accuracy and positive elimination of all waste.**

$10,000 Book of Plans

Be sure to mail free coupon for the latest edition of our famous $10,000 PLAN BOOK, now ready. Contains 100 Modern Harris Home Designs, with Floor Plans, specifications, prices; etc., and explains how we save you $25.00 to $50.00 on plans alone. Think twice before you pass this opportunity.

FREE to all readers in the United States. To foreign countries on receipt of 25c.

Dept. HD 7
Harris Bros. Co., Chicago, Ill.
Please send me Free —without the slightest obligation—the following Books checked:
☐ Book of Plans.
☐ Plumbing and Heating.
☐ Paints
☐ "Presto-Up" Sectional Houses and Garages.

Name .....
Address ..... *State* .....

FREE Plan Offer

$1.00 brings complete Blue Print Plans for these or any Harris Homes in our Plan Book. Specifications and Material List tell exactly what is furnished with each Home. If you purchase material of us, plans are FREE.

"Presto-Up" SECTIONAL HOUSES

$399 buys this 4-room sectional bungalow
The most wonderful building of its kind to be had today. Guaranteed from foundation to roof. In use by U. S. Government, Aero, Radio and War Depts. and large industrial companies. Scientific Construction, handsome in appearance, lasting in quality and low in price. Industrial House for mines, etc., etc., at low prices. Stronger than the ordinary method of building. Prices, $150.00 and upward. Garages, $83.00 and up.

HARRIS BROS. CO. Dept. HD 7 35th & Iron Sts. CHICAGO

Popular Mechanics Magazine

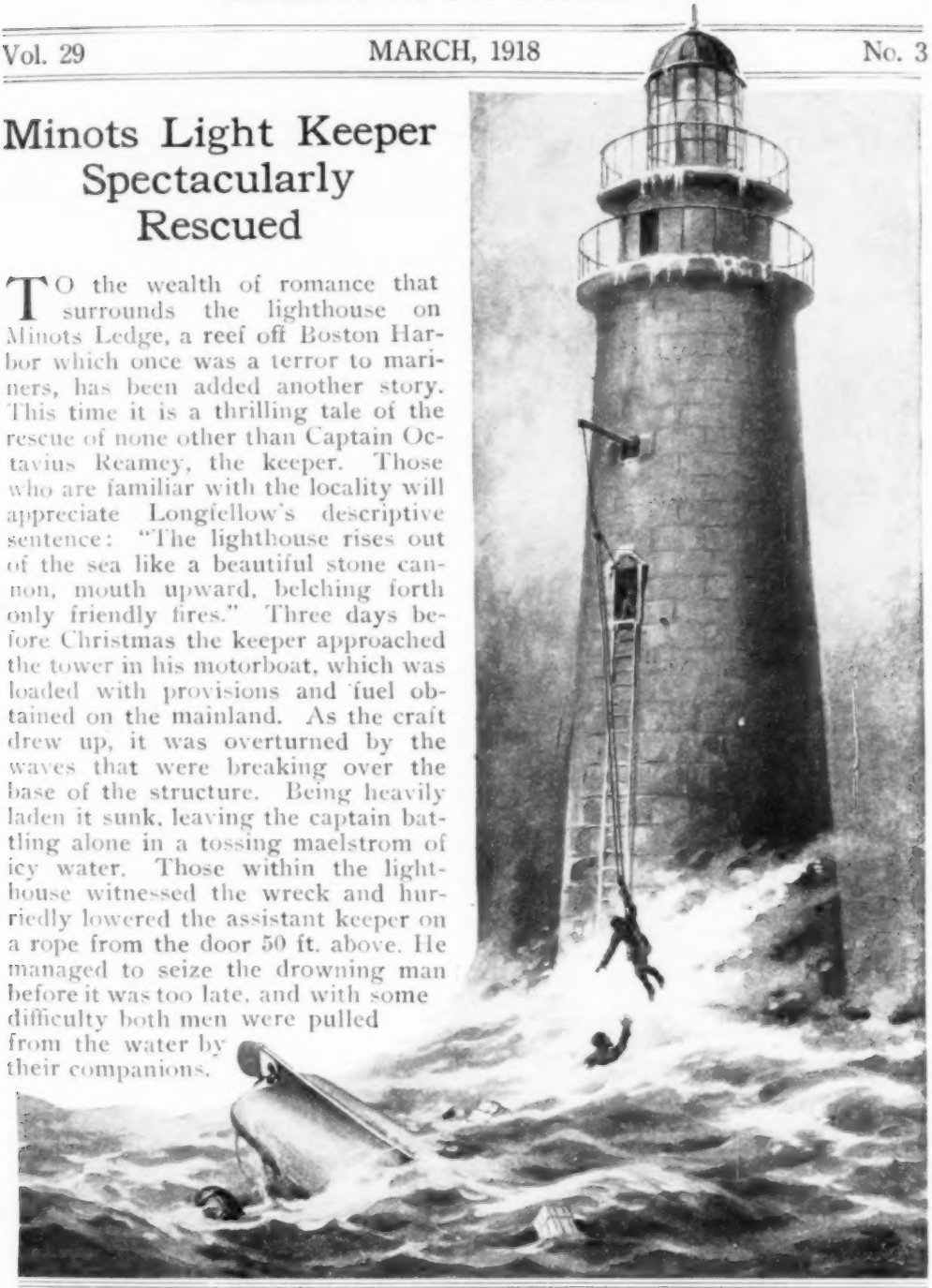
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 29 MARCH, 1918 No. 3

Minots Light Keeper Spectacularly Rescued

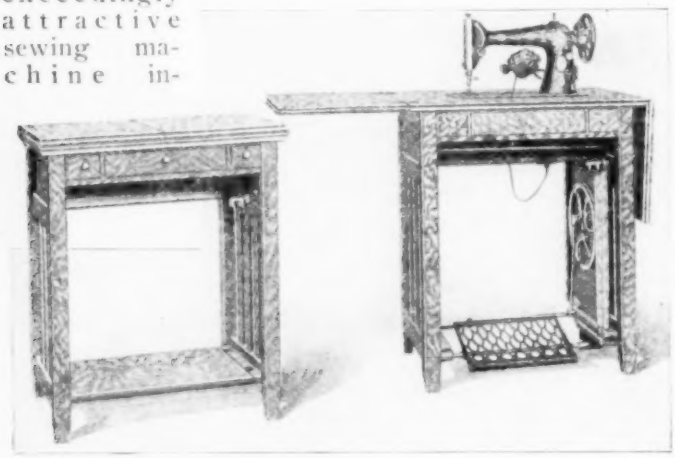
TO the wealth of romance that surrounds the lighthouse on Minots Ledge, a reef off Boston Harbor which once was a terror to mariners, has been added another story. This time it is a thrilling tale of the rescue of none other than Captain Octavius Reamey, the keeper. Those who are familiar with the locality will appreciate Longfellow's descriptive sentence: "The lighthouse rises out of the sea like a beautiful stone cannon, mouth upward, belching forth only friendly fires." Three days before Christmas the keeper approached the tower in his motorboat, which was loaded with provisions and fuel obtained on the mainland. As the craft drew up, it was overturned by the waves that were breaking over the base of the structure. Being heavily laden it sunk, leaving the captain battling alone in a tossing maelstrom of icy water. Those within the lighthouse witnessed the wreck and hurriedly lowered the assistant keeper on a rope from the door 50 ft. above. He managed to seize the drowning man before it was too late, and with some difficulty both men were pulled from the water by their companions.



After the Assistant Keeper had Reached Captain Reamey, and Managed to Get a Secure Hold of Him, the Two Men were Lifted from the Waves to the Lighthouse Door

SEWING MACHINE SERVES AS TABLE WHEN CLOSED

To the list of furniture of the convertible variety may now be added an exceedingly attractive sewing machine ingeniously designed so that it can be quickly transformed into a library table. The rectangular top of the table is composed of two hinged leaves which, when turned back, permit the disappearing head of the machine to be brought into place. The square straight legs are of wood instead of the heavier metal construction common in sewing machines, and what serves as a lower shelf for the table is so hinged that it can be swung into a vertical position, exposing the treadle and bringing into place a band wheel and connecting rod. The machine is operated either by electricity or foot power. In the former case a small motor at the rear of the head is swung to engage the rim of the balance wheel and current is taken from any convenient wall plug or light socket.



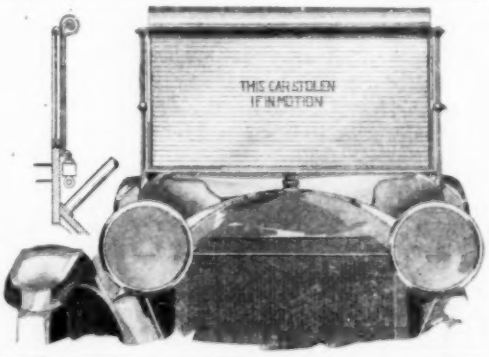
An Artistically Designed Sewing Machine of the Convertible Type: At the Left It is Closed for Use as a Library Table; at the Right It Is Ready for Operation by Electricity or Foot Power

DICTAPHONE MAKES RECORD OF DISPATCHER'S ORDERS

With the mouthpiece of a dictaphone attached to the telephone transmitter, the dispatcher for an electric railway in Missouri is able to record his instructions given by telephone to conductors at various points on the line. Lifting the receiver from the hook starts the dictaphone cylinder rotating. The records made in this way are dated and preserved for a time so that they may be referred to in case any dispute arises as to the character of the orders given.

STEEL WINDSHIELD CURTAIN PROTECTS UNATTENDED CAR

To guard a motor car against theft, a steel curtain of the roller type bearing the legend, "This Car Stolen if in Motion," has been devised. Upon leaving a machine the driver would lower the shade in front of the windshield and lock it in position, in this way obstructing the view ahead. The car could not be driven without attracting attention, unless the curtain were removed. This would be sufficiently difficult, it is assumed, to make the object patent to passers-by.



The Curtain is Made of Metal Strips and is Held on a Spring Roller Mounted in a Steel Case above the Windshield

Tanks to Reclaim the Farms of France

By Lewis R. Freeman

COPYRIGHT, UNDERWOOD & UNDERWOOD

SCIENTISTS predict a long period of unproductivity for farm lands in the war districts of France and Belgium, because of the deep pitting and overturning of the soil. Lewis R. Freeman, special war correspondent for Popular Mechanics Magazine, views the matter in a different light. He used explosives in the cultivation of a western ranch and secured marked increase of crops. The great problem seemed, to him, the clearing of the debris-strewn land. Then the big idea developed—why not use the tanks to smooth out the wrinkles of war? Mr. Freeman—the practical farmer—outlines for us his plan.—Editor.

A GOOD deal has been written about the rebuilding of the destroyed towns and villages in the battle-ravaged area of northern France, and it is also encouraging to record that a good deal of tangible progress has been made toward getting started with this part of the restoration work as soon as there is opportunity to do so. Money in abundance—much of it from America—has been pledged, so that a beginning on a grand scale is possible just as soon as labor is available—probably not long after the declaration of a general peace.

Much has also been written about the restoration of the farming land of the battle areas, but—in contrast with the progress that has been made in getting ready to rebuild the towns and villages—little in a practical way has yet been done toward taking up the task itself. It may be just as well to point out at the outset, then, that any program which does not make the restoration of the farming land a condition precedent to the rebuilding of the villages will be a sadly misdirected if not a futile one. This will be readily understood from the fact that practically the only *raison d'ètre* of 99 per cent of these little rural communities was as trading centers for the farms and farmers, so that unless the farms themselves are restored to cultivation there will be nothing to warrant the existence of the villages, whose peoples must inevitably drift elsewhere to find a livelihood.

This being so, it is no end of a pity that practically all that has been written on the question of restoring the farms to their former productivity has been of a pessimistic nature. There is an old saying to the effect that "war passes the theorist by and sinks its plummets deep in human experience." Most of the pessimistic writing to

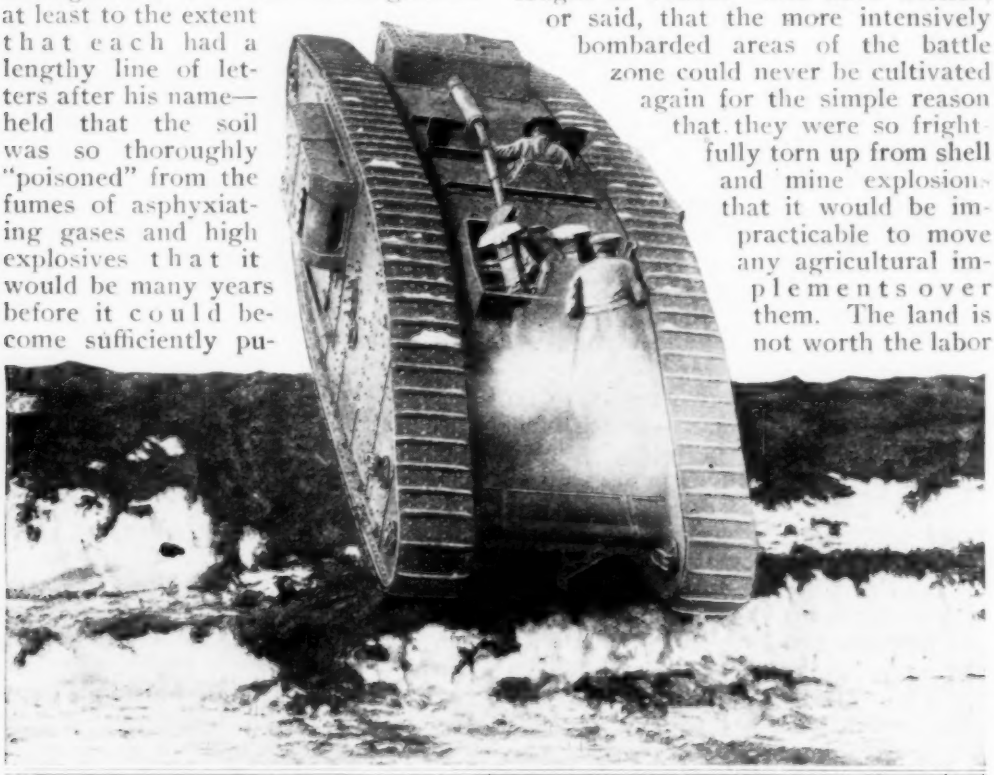
COPYRIGHT BY POPULAR MECHANICS MAGAZINE

which I have referred is by theorists, who do not realize that "war has passed them by," and that their "theorizings"—no less mischievous than discouraging—have already been confuted by cold facts.

Ever since the battle of the Somme was well under way—with its obliterative artillery preparations and barrages—I have been reading in French, English, and American newspapers, and reviews, articles, or letters—several from not "un-eminent" scientists and engineers—all purporting to demonstrate beyond the peradventure of a doubt that the once fertile agricultural region of northern France—that part of it, of course, which has been most heavily fought over and bombarded—could not but remain an absolute desert (so far as agricultural production is concerned) for anywhere from a minimum of two or three decades to half a century and more. Two or three distinguished chemists—distinguished at least to the extent that each had a lengthy line of letters after his name—held that the soil was so thoroughly "poisoned" from the fumes of asphyxiating gases and high explosives that it would be many years before it could become sufficiently purified to support any kind of plant life. A professor of agricultural science was equally certain that the bringing to the surface of so much of the lower strata of soil—which contains little or no humus—would render the land too sterile to be worth cultivating for an indefinite but very long time.

Practically all of the more "learned" of these theorists appeared to base their beliefs that the French battle fields were doomed to remain deserts on the poisoned-soil or debilitated-soil ideas. None of them—so far as I remember—claimed to have made any study of the question in the battle area itself. If they had—especially during the last summer—they would have seen a few things calculated radically to alter their opinions. What these things are I will outline presently.

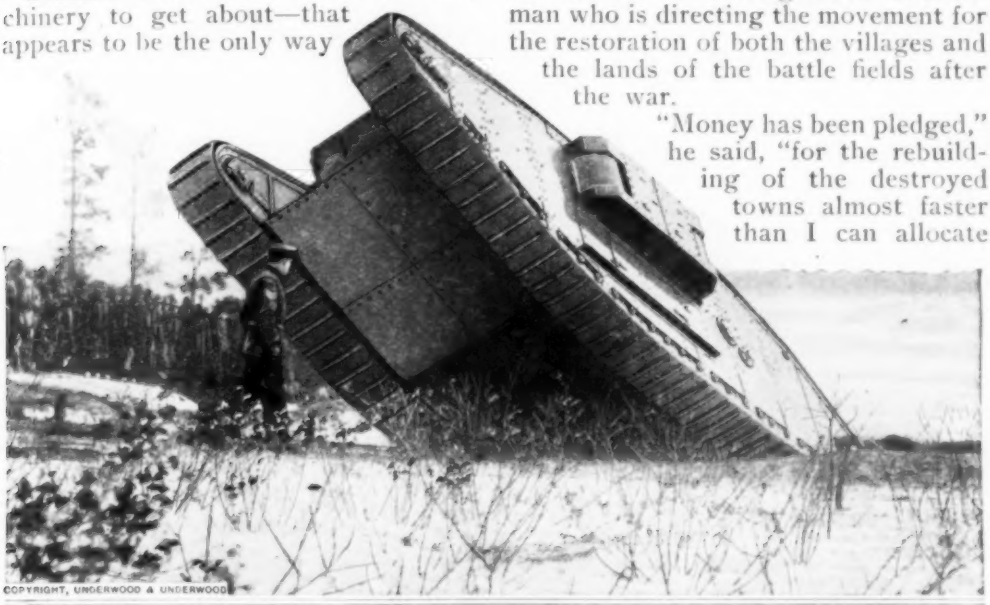
Besides these laboratory experts, there are many level-headed men—including not a few soldiers who have fought in France—who have written, or said, that the more intensively bombarded areas of the battle zone could never be cultivated again for the simple reason that they were so frightfully torn up from shell and mine explosions that it would be impracticable to move any agricultural implements over them. The land is not worth the labor



COPYRIGHT, UNDERWOOD & UNDERWOOD

A British Tank Climbing an Embankment at an Abrupt Angle: This Tank is Touring the United States. The View was Taken in the East in a Locality Where the Land is Very Rough

of leveling by hand, they say, and yet —because there is no room for machinery to get about—that appears to be the only way



The Same Tank Viewed from the Other Side: As an Agricultural Implement, Exclusively, the Tank would have Been Inconceivable; as an Adaptation to Agricultural Purposes after the War, It Solves a Great Problem

the thing can be done. They also point out that the hundreds of miles of barbed wire inextricably mixed with the earth will make it extremely difficult to plow or harrow, while the countless thousands of buried unexploded shells—which might conceivably go off when turned up—introduce a certain element of actual danger.

The views of these latter are entitled to the respect due to any honest opinion based on first-hand observations. Even so, however, I am convinced that their pessimism regarding the problem in hand is only less warranted than that of the theorists pure and simple. That is to say: The physical difficulties—great as they are—in the way of cultivating even the most heavily bombarded regions of the war zone are not going to prove an insurmountable obstacle to their restoration to productivity; the averred poisoning of the soil is the merest "bogey," and is not going to prove an obstacle at all.

How mischievous these not ill-intentioned but certainly ill-advised pessimistic utterances have been, I had opportunity to judge recently when I talked with a distinguished Frenchman who is directing the movement for the restoration of both the villages and the lands of the battle fields after the war.

"Money has been pledged," he said, "for the rebuilding of the destroyed towns almost faster than I can allocate it; but whenever I endeavor to present the case for funds to be used in putting the land again under cultivation I am met at once with skepticism and lukewarmness. This or that scientist, I am told, or this or that general or cabinet minister has said it can never be done; so why should they be asked to subscribe money for a scheme that is foredoomed to failure when the needs for actual housing are so great? That sums up the popular attitude in the matter, and so far, my efforts to show that there will be no use in restoring the villages unless the farms are restored at the same time, have not met with much success. Moreover, until a presentation of the true facts of the case undoes the harm that has been done by all this loose talking and writing, we are going to be greatly handicapped in making adequate provisions to get the work under way. Anything you can do to show what utter nonsense is this idea of abandoning so many square miles of our fairest farming lands and allowing them to revert to primeval desert without an

How the Tanks could be Used to Reclaim the Fields of France: The Monster Machines would Draw the Occasional Explosion of a Buried Shell could Not Seriously Damage Them. Carts would Collect the Upturned Debris, While Heavy Drags would Smooth and

effort to reclaim them will be a real service to my country and my countrymen."

To those scientists who hold that the land of the battle areas has been poisoned beyond remedy by gas and shell fumes, I might point out that, while these fumes occasionally bleach and cause fresh grass and foliage to wilt and die down, the effect is only temporary—usually only for a few days, rarely for more than a week or two. If the roots are injured, it is from being torn up by explosions, not from the fumes. In any event, the soil itself is not deleteriously affected. As to the effect of the constant churning of the earth by bursting shells, I might point out that subsoil cultivation by the use of dynamite has been practiced with invariable success in America for several years. I myself have practically rehabilitated a run-down and almost worthless apricot orchard on my California ranch by systematically cracking up the underlying hardpan with dynamite and giving the starved roots a chance to penetrate to the moisture-laden levels below. Even a barley field increased its yield 50 per cent after a thorough tearing up by exploding small charges of dynamite at 20-ft. intervals. In all the world I know of no land that would be likely to benefit more by a cracking up of its subsoil than that of northern France, underlaid, as it is, by strata of decomposing chalk. Well, just such a cultivation it has now received, and a hundred times more thorough than any farmer who had to buy the explosive himself would ever give it.

To the professor of agricultural science who maintained that the land of

Long-Toothed Harrows, So Constructed That Following at a Safe Distance Level the Rough Land

the battle areas would be debilitated by the admixture of a great quantity of non-humus-bearing soil from below. I might point out that for every pound of the latter thrown up by a shell from the "apex" of its crater, anywhere from 50 to 100 pounds of earth rich in decaying vegetable matter is scattered from the part of the cone which is torn out nearer the surface. A one or two or even a five-per-cent admixture of non-humus-bearing subsoil will do the surface soil more good than harm, as any farmer who has practiced extra-deep plowing will testify.

I might, I say, point out all of these things to the scientists and professors, in an endeavor to controvert their theories by what I know to be facts. Fortunately, a better way was open to me. Through the courtesy of the French and British war offices, I made a visit in person to the principal battle areas of the western front, there to study at first hand—in the light of my experience as a farmer—the problem of the restoration of the shell-ravaged fields. The regions visited included the four most bitterly fought over in the west—Flanders, the Somme, the Champagne, and Verdun—and no sooner had I traversed a mile of the first of them than I had all the evidence I needed to convince me of the "utter nonsense" (to use the expression of the French official I have quoted) of the contentions of the learned theorists who so lightly condemned these blood-hallowed fields to half a century or so of "desert-dom."

There is one of the quatrains of the Rubaiyat which begins:

"I sometimes think that never blows so red
The rose as where some buried Caesar bled. . . . ."

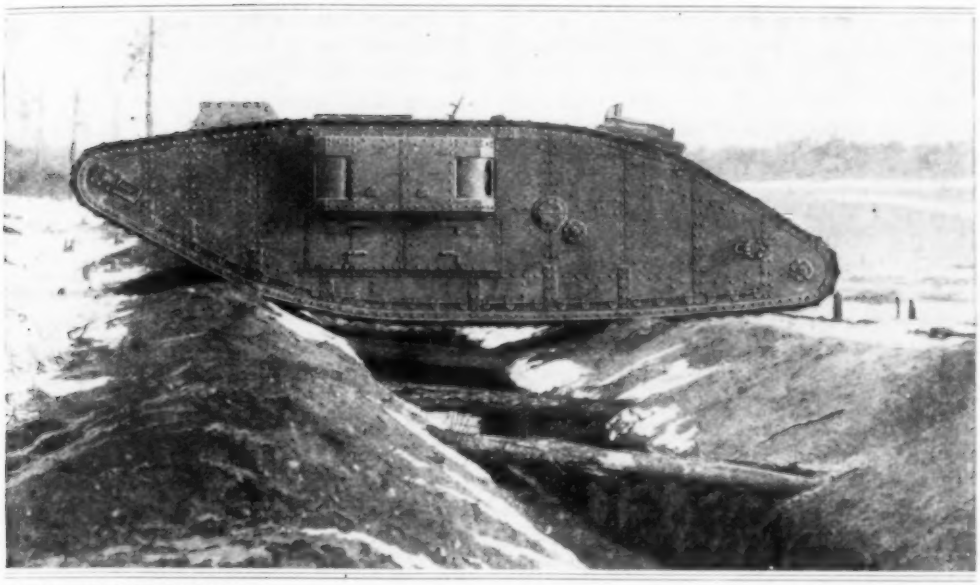
Old Omar Khayyam never saw a battle field after a bombardment with modern high explosives, but the fact remains that these lines might just as well have been written of the Somme or Champagne as of the fields where the hosts of Xerxes and Cyrus fought and bled. Never under the hand of the husbandmen have the fields of northern France brought forth such a wealth of verdure as this last summer, and the fact that most of this growth consisted of wild flowers and weeds was merely because nothing else had been planted in their stead. Trenches, used and disused, were clothed to their parapets in a dense mass of rank vegetation, and the only shell holes which were not half submerged in greenery were those which had been formed within the month.

The only evidence of poisoned ground I saw was where a saffron pool—a foot or two across—had formed under a cracked but unexploded shell or where a film of petroleum had been deposited on the grass of some undrained hollow. Likewise debilitated ground only appeared where some sharp ridge or hill had been scoured down to the very bedrock by intensive bombardment, and even then the barren area was usually measurable in yards.

That endlessly fought-for and bombarded Butte de Warlencourt was the most striking example I came across of this sort of thing. That strange little wart on the Somme plain must have had all of 25 feet of its round top blown off by the thousands and thousands of British and German shells which were rained upon it in the months before the retirement to the Hindenburg line put an end to its value as the one observation post on the whole sector. Yet, on only the last 10 or 15 feet of solid chalk—the bald crown of the Butte de Warlencourt's devoted head—has the vegetation failed to find a footing. The lower two or three hundred feet of slope was knee-deep in fragrant verdure, and one had to step with care to avoid tripping in the fragments of barbed wire it concealed.

And not only was it the wild flowers and weeds and other hardy things that were springing fresh and green, but even such "domestics" as had the chance were making the bravest of showings. In one place I saw where the seeds of the petunias, snapdragons, and nasturtiums of a little old-fashioned garden, which had been turned over a dozen times by bursting shells, had sprouted, grown, and were flowering as I have rarely seen any of their kind flower before, even under the hand of a gardener. A score of times I walked in head-high patches of "volunteer" oats, wheat, and barley that would undoubtedly have dwarfed the carefully manured and tended crops which grew there three years previously, and once—near the site of the pigsty of a ruined chateau, growing from the bottom of a "Jack Johnson" hole—I saw a towering clump of Indian corn which might well have given pause to a tank.

A day on the Somme last summer would have been quite enough to convince the most skeptical that, if this region really was doomed to revert to desert, it was not going to be because the ground was poisoned or debilitated. The physical problem of cultivation is, however, quite another matter. I must confess that when I first saw the condition in which the ground about Thiepval, Fricourt, Contalmaison, Pozières, and a dozen other bitterly fought-for points in the Somme area, had been left, I was so appalled by the sight that, for the moment, I was inclined to share the view of the many who were saying that no practicable way ever would be found for putting it under cultivation. It did not seem quite so hopeless after I had seen a portion of a "cleaned-up" battle field—one which had been picked over for wire, shells, trench material, rifles, and all the rest of the flotsam and jetsam



COPYRIGHT, UNDERWOOD & UNDERWOOD

Probably No Feature of the Tank will Make It More Important Agriculturally Than Its Ability to Cross Ditches, Ravines, and Trenches. The War Zone Is a Crisscross of Trenches and a Less Versatile Machine Than the Tank would be Seriously Hampered in Its Operations

of battle—but it was not until the day I met a Canadian officer, who (like myself) owned a western ranch and had broken up new land with a tractor, that a solution of the problem suggested itself.

"The danger from unexploded shells is practically negligible," said he, "for the simple reason that a detonator that has failed to go off at the end of a five or ten-mile flight through the air is not likely to be greatly disturbed by a prod from a plowshare. Also, the explosive in a shell or hand grenade tends to deteriorate very rapidly after burial in damp earth. There need be no worry on that score. Neither will buried barb wire give much trouble for any length of time. That which can be got hold of from the surface will be picked up long before the war is over, while that which is buried out of sight can be pulled up—or cut off far enough down to keep it from fouling the plow again—as fast as it is run into, which will not be for more than a year or two after regular cultivation is under way. Railroad iron, concrete fragments, corrugated-steel roofing, and other heavy trenching material will have to be picked up and carted off bodily.

"All of this leaves," he continued, "the discovery of a practicable way of effecting the first rough cultivation as the one great problem to be solved. Once the plows and harrows and disks are able to go over the ground, the 'smoothing-out' process will go on automatically, for the simple reason that earth displaced in the ordinary routine of cultivation always tends to work downward so as gradually to obliterate the hollows and humps. Indeed, it is astonishing how much is accomplished in this direction by the erosive action of the elements alone. Blown dust and rain-washed silt will deposit a foot of earth a year in the bottom of an ordinary shell hole, and the great mine crater at Pozières must have decreased 20 or 30 feet in depth—due principally to the sluicing down of its sides in the torrential rains—in the 11 months which have elapsed since it was made.

"Since irrigation is not practiced to any extent in this part of France, it will not be necessary to reduce the land to any such a 'billiard-table' evenness—or even to establish 'contour' levels—as would be imperative if we had to do with South Africa or Cali-

fornia. Given a first thorough 'going over'—one that will smooth the ground sufficiently to allow the use of the farmer's ordinary instruments of cultivation immediately afterward—and the problem is solved for good and all; the land itself will produce all the heavier for its stirring-up and three or four years of rest.

"The question then narrows down as to what sort of a machine will have to be devised to accomplish this preliminary work. I won't need to tell you that the ordinary type of side-wheel tractor would not progress its own length over an average stretch of crater ground, nor that even the largest and most powerful caterpillar would stall down in the first big shell hole and have to give up the game for good at the first uncaved-in line of trench. Unless the millions of such obstacles are to be leveled by scrapers or steam shovels—at a prohibitive cost—a machine will be needed which can pursue the even tenor of its way straight across them. And right there you have the answer to those who are asking what is to be done with the thousands of tanks that will be left 'without occupation' at the end of the war. Use them for tractors to draw specially devised plows and harrows in the first rough cultivation of the crater areas. The extent of the fought-over ground which is too torn up to be cultivated in the ordinary way can hardly run to more than a few hundred square miles at the outside, and ten times as many tanks will be available as would be necessary to give this a complete going over in a fortnight or so. There will also be an ample supply of trained drivers to run them, though the handling of a tank is something that any man who can run a tractor or motor lorry can pick up in a day or two. The nature and design of the implements to be drawn would have to be determined by experiment, but there is no reason why these should not be initiated at once, so that whatever types are determined on could be built and ready for use at the first opportunity. Indeed, assuming that the Germans are to be pushed still farther back—or even held where they are—on the St. Quentin-Cambrai front, there is no reason why the restoration of the crater area of the Somme battle field should not be taken up at any time."

He had not, this officer concluded, given any definite thought to the design of the implements to be used, but, offhand, he thought that the prime desideratum would be an ability to clear up as much buried débris as possible in the process of cultivation, and also to exercise a maximum leveling effect. Great strength and—if any difficulty were experienced on this score—more or less invulnerability to subterranean explosions would be a *sine qua non*. Since this meeting, however, I have had the good fortune to spend an evening in his company while he was on leave in London, and the following tentative scheme for preparing the crater areas for cultivation by means of tanks was drawn up on that occasion.

The ground should be ready for its first going over just as it is left by the ordinary cleaning-up work now being carried on, in which the solid material of all kinds lying on the surface is picked up and carried away. The first implement to be used would be a harrow of enormous strength, the function of which would be to rake the earth to a depth of a foot and a half or two feet, dragging up any buried wire or other débris likely to interfere with the later routine cultivation. For the sake of strength and balance, it would best be made triangular in form, and built to be towed from the apex by a 15 or 20-ft. cable running to its tank. This, or even a greater length of cable, would be necessary to insure that both tank and harrow should not be in difficulties in the same hole at once. The teeth, made of two-inch steel bars, would be set at wide intervals—certainly not less than six inches apart—and provided (either by rows or individually) with levers that would slope them back in disentangling any débris raked up. A crew of two or

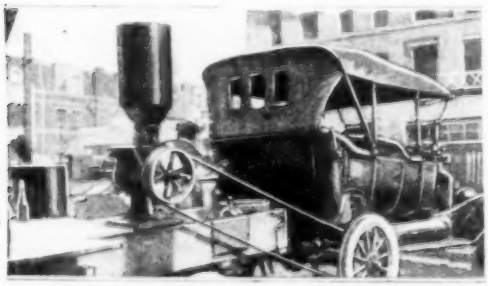
three men would be ample to work the harrow, but it would probably be found necessary to follow it with a tender and a gang of "scavengers," to dispose of the stuff it clawed up. It might be found practical to fix a scraper on the rear end of the harrow, which would help in pushing down hummocks and in filling hollows.

The size of an implement of this kind would have to be worked out after determining the resistance it offered with its teeth set at full length. It would also, of course, vary with the power of its towing tank. The amount of "open work" in its frame should make it more or less impervious to serious injury from explosions, but if it were found that these were going to be frequent—which is highly improbable—it would doubtless prove advisable for its crew to follow on foot or ride on the tank.

The effect of an implement of this kind—especially if equipped with the scraper—going over even the roughest area would be to reduce the largest shell craters to rounded depressions, as well as to break down and largely to fill in even the deepest and widest trenches. One more "tank operation," however, would probably be required to smooth the ground sufficiently for ordinary cultivation. This might take the form of towing a string of heavy tractor plows over the harrowed section. A series of foot-deep, 18-in. wide furrows should come pretty near to disposing of any irregularities prominent enough to interfere with the operation of tractor or horse-drawn implements. If, however, there were still too much of a ditch where some of the trenches had been, this could be reduced by running the tank up one side and down the other, with its following plows throwing earth into the depression both ways. (I have often closed up storm-water "washes" on my California ranch by using a tractor in a similar way.) After that, the roughest stretch of crater land should be in shape for the French peasant to resume "business as usual."

WOMAN USES AUTO TO RUN PEANUT GRINDER

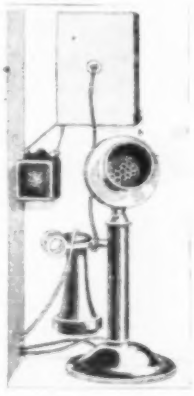
A woman to whom space is allotted in a western public market uses her automobile in making fresh peanut butter for her customers. The peanuts are treated in a grinder mounted on a trailer, set just back of the car in the market. The car is jacked up and power transmitted from its rear axle to the grinder by a belt. The top of the trailer serves as a display stand.



Automobile Driving a Peanut Grinder in a Public Market for a Woman Who Specializes in Fresh Peanut Butter

ATTACHMENT MAKES PHONE AN AUTOMATIC ALARM

By means of a thermostatic attachment, recently patented, a telephone instrument can be made to serve as an automatic fire alarm without interfering with its ordinary use. The apparatus is contained in a small case that fastens to the wall near the telephone. When the temperature rises above a certain point thermostats in the case turn on an electric current, sounding a buzzer and, by means of a simple mechanical device and a connecting cord, lifting the receiver hook so that central hears the alarm. The buzzer continues to sound until the connection is broken.



COPYRIGHT, UNDERWOOD & UNDERWOOD

So Great Was the Impact That the Tower was Bent and the Aeroplane Made Fast

HEROIC RESCUE MARKS AIRPLANE-WIRELESS WRECK

Written in the log of a British seaplane that met with an unusual accident recently, is the story of a thrilling rescue that involved real heroism. Emerging from a dense mist the machine crashed against the upper part of a tall, slender radio tower. The impact was so great that the mast was bent far out of line, the aerial engine wedged between the interstices so that the plane was suspended almost at a right angle, and the pilot catapulted onto one of the wings, where he lay unconscious. A strong wind added terror to the situation, swaying the damaged mast until its collapse seemed a matter of seconds. As luck would have it, three sailors were at the time painting the steelwork some distance below, and one of them, named Rath, with characteristic nimbleness, climbed up the inside of the tower to the point, nearly 300 ft. above the ground, where the craft was fast. Crawling out on the wing, he reached the senseless airman and prevented him from falling until his two comrades, named Knoulton and Abbott, were able to pass him a rope. Tying this about the injured man's body, he lowered him to the ground. The three sailors then made their own descent. Medals, it is understood, are to be awarded to the seamen in recognition of their work.

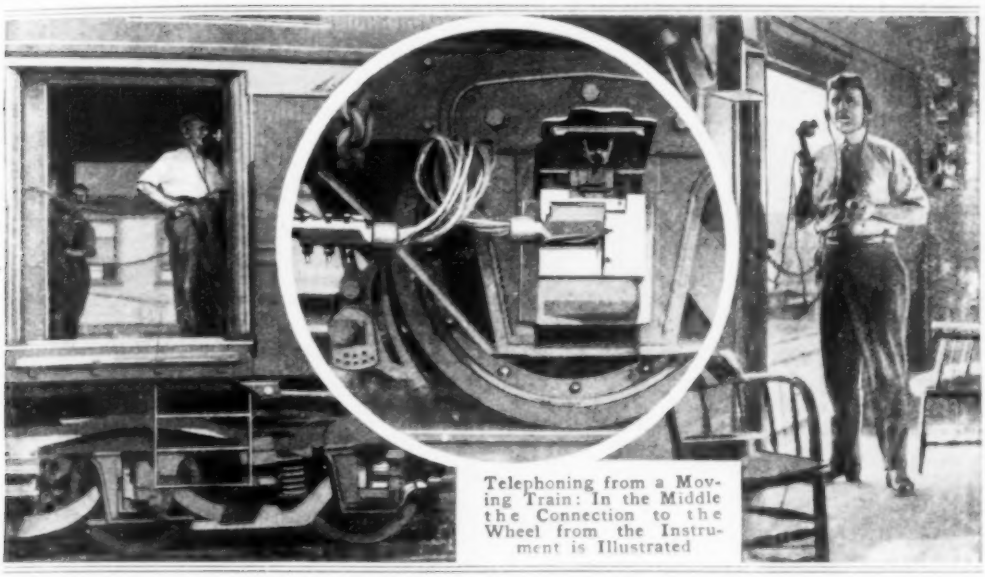
NAVY AGAIN APPEALS FOR BINOCULARS

The navy urgently needs binoculars, spyglasses, and telescopes. A recent appeal by the government brought 3,000 pairs of glasses, but many thousands more are needed to supply every ship with the extra "eyes" so vital in fighting submarines. As other channels of supply are closed, the patriotism of the people must be relied on to meet this emergency. Sextants and chronometers are also urgently required. All articles should be forwarded by mail or express to the Hon. Franklin D. Roosevelt, Assistant Secretary of the Navy, care of the Naval Observatory, Washington, D. C. They should be securely tagged, and those not suited to naval use will be returned. For the acceptable ones a nominal compensation of $1 will be paid, which will constitute the rental price or, in case of loss, the purchase price. The owners' names and addresses will be permanently recorded and every effort made to return the articles after the war.

TELEPHONE FROM CANADIAN TRAIN WHILE IN MOTION

According to information from a reliable source, experiments conducted on the Canadian government railways with a telephone apparatus, that permits verbal messages to be transmitted to and from moving trains, have met with highly gratifying results. Standard equipment is used and no difficulty has been encountered in getting distinct tones. Connection between the instrument and rail is made through the car wheels. Control of the system differs in no respect from ordinary telephone operation, and artificial amplifiers requiring adjustment are not employed. The invention makes it possible for connections to be

ROLLERS ON DIGGER PULL



Telephoning from a Moving Train: In the Middle the Connection to the Wheel from the Instrument is Illustrated

made between the train instrument and that of any regular telephone subscriber. Train speed is of no material consequence, for the same results are attained traveling 60 miles an hour as when barely moving. Tests have been made daily since the middle of last July on a train operating between Moncton and Point du Chêne, New Brunswick.

The results are not influenced either by the presence or absence of block-signal installation. Properly bonded rails are the chief requirement. With the requisite instruments, three separate conversations can be held simultaneously.

SAMMY WALKS TIGHT ROPE AT CAMP EXHIBITION

WHEN Y. M. C. A. officials at Fort Clark, Tex., were seeking soldiers accomplished in various ways to assist them in an outdoor entertainment for the camp, they discovered one man in uniform who was a tight-rope walker. To utilize his ability, a rope was stretched high above the heads of the audience and on it the soldier-performer proceeded to display his skill, seemingly undisturbed by the absence of a net below to catch him in case of a fall.

SOUND REPRODUCTION BY NEW METHOD

ROLLERS ON DIGGER PULL VINES FROM POTATOES

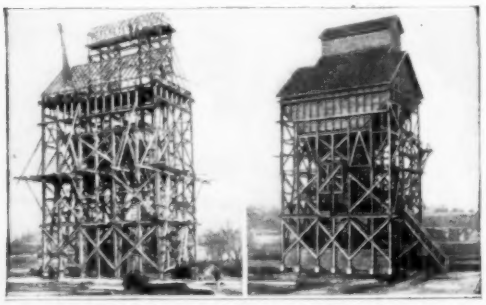
A set of rollers that strips the vines from the potatoes is a feature of a new horse-drawn potato digger. The plants

A Potato Digger with Rollers at the Rear That Separate the Vines from the Tubers After the Latter have been Pulled from the Ground

are pulled up by the machine as it moves along and are carried on an endless conveyor to a set of four parallel rollers at the rear. These separate the tubers from the vines, thereby eliminating considerable handwork.

PLANT COALS LOCOMOTIVES IN THIRTY SECONDS

Efficiency in railway operation finds excellent illustration in the coal-hand-



Left: Framework of a Railway Coal-Handling Plant, 100 Feet High, Having a Capacity of 500 Tons. Right: The Completed Structure beneath Whose Hopper an Engine can be Coaled in 30 Seconds

ling plant recently completed by the Rock Island Railway at Trenton, Mo., with which a locomotive can be loaded with 16 tons of fuel in 30 seconds. On account of the scarcity of steel the structure was built of wood. It stands 100 ft. high and has a 30-ft. basement for dumping cars, while the reservoir, of 500 tons' capacity, is some 80 feet above the track. About 600 tons of coal per hour can be handled by the electric hoist.

CLEAN NOVEL SPARK PLUG BY PRESSING PLUNGER

As balm for the motorist, a quick-cleaning spark plug designed to facilitate the removal of carbon and oil has been introduced. A spring plunger extending through the top of the plug forces the center electrode through an aperture in a bridge at the bottom and removes all matter adhering to it. The same action cleans the two side wires by pushing a coil spring between their points, and scrapes the porcelain. The operation requires no work other than the depression of the plunger.

"BUTTON STICK" COMBINED WITH TRENCH MIRROR

A military mirror consisting of a polished metal plate has been combined with a slotted back support that also serves as a "button stick." A button stick is a protector placed beneath a button while it is being polished, to prevent soiling or injuring the cloth. The free ends of the brace fit beneath turned edges of the mirror when not in use.

SOUND REPRODUCTION BY NEW METHOD MAKES TALKING PHOTOPLAYS POSSIBLE

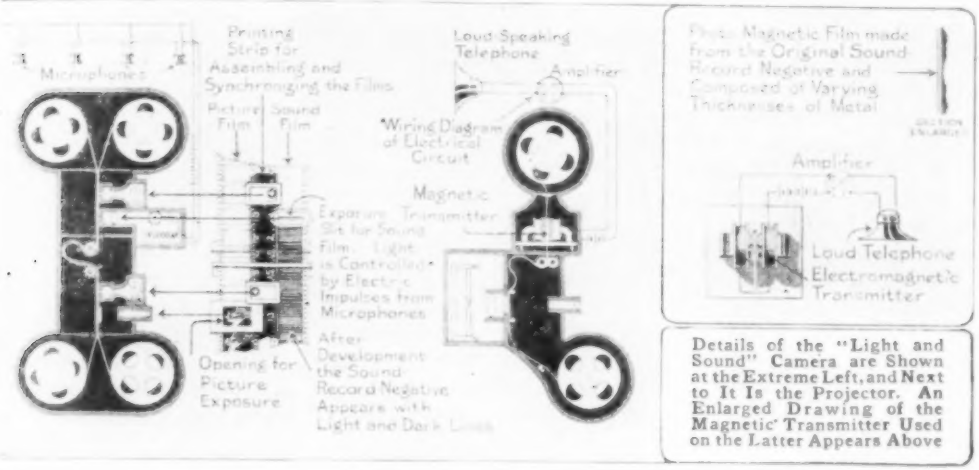
TALKING photoplays appear to be within close reach of devotees of the movies. The development of an original method of recording sound, and its adaptation to the film drama, constitute an important invention of more than passing interest that is now in the course of refinement.

Numerous attempts have been made to link the phonograph with the projector and give speech to the silent drama. Inability to obtain perfect synchronism of sound and motion has been only one of the bugaboos encountered. The limited capacity of talking-machine records, the difficulty of amplifying the sound sufficiently for theater purposes without increasing the foreign noises to an objectionable degree, and the impossibility of cutting or mending a film without destroying the usefulness of the sound record have been other of the bewildering enigmas. Their solution has finally been undertaken in a new way and highly promising results attained.

The newest system of talking cinematography eliminates the phonograph and utilizes a film record that is produced by photographic and rendered by magnetic, instead of mechanical, means. This enables the sound and the picture records to be of corresponding lengths and synchronous.

A camera that exposes two films simultaneously is used. One of the sensitive ribbons records the pictures, the other the sounds. A third and opaque strip, which is really a part of the instrument, overlaps adjacent edges of the two films and prints numbers at corresponding points on each so that after completion they can be properly registered.

By photographing the light of an incandescent filament that is controlled by sound waves, the spoken part of the drama is recorded. The film passes behind a hairbreadth transverse aperture, in front of which is an elongated cylindrical lens and a straight filament lamp. The filament is parallel with the slit and the light from it is focused through the latter upon the film in a horizontal line without halation. In the lamp circuit is a battery and one coil of an electromagnet, around which another coil, arranged in circuit with a series of concealed microphones and a second source of energy, is wound. Owing to the relation of the coils, the intensity of the lighting circuit is fluctuated by induction through the action of the sound waves upon the microphone circuit. Thus the words spoken by an actor, while playing his rôle before the camera, are picked up by the sensitive detectors and made to produce


Microphones
Printing Strip for Assembling and Synchronizing the Films
Picture Film
Sound Film
Opening for Picture Exposure
Exposure Slit for Sound Film—Light is Controlled by Electric Impulses from Microphones
After Development the Sound Record Negative Appears with Light and Dark Lines
Wiring Diagram of Electrical Circuit
Loud Speaking Telephone
Amplifier
Magnetic Transmitter
Photo Magnetic Film made from the Original Sound Record Negative and Composed of Varying Thicknesses of Metal
Amplifier
Loud Telephone
Electromagnetic Transmitter

Details of the "Light and Sound" Camera are Shown at the Extreme Left, and Next to It Is the Projector. An Enlarged Drawing of the Magnetic Transmitter Used on the Latter Appears Above

variations in the intensity of the light. Therefore the intensity of the delicate lines imprinted on the constantly moving film is correspondingly varied. The impressions, when developed, form a ladderlike strip of alternating light and dark marks that merge into each other, pitch determining the number of gradations to the unit of linear space, and volume affecting the degrees of transparency. Thus is sound photographed through the medium of light and a negative record obtained.

When photographing a scene it is necessary for the film to be moved intermittently. And since a continuous, even motion is required in exposing the sound film, special provision is made in the camera to meet the two conditions. Because the films are threaded side by side, the lens for the sound film is mounted at a point several inches above the other one. This arrangement enables the two films to be moved uniformly and continuously in passing the first point and intermittently thereafter.

In making a positive from the photogram negative, a special emulsion film consisting of gelatin with molecular iron in suspension and sensitized with bichromate of potash is employed. During the printing process the coating is hardened at all points where light penetrates the negative, and to the greatest depth at places in contact with its most transparent parts. Where covered by the darkest lines, which represent the softest sounds, the material hardens only to slight depths. When later washed in warm water, the unhardened emulsion dissolves, giving the face of the film an undulating metallic surface consisting of a series of ridges and depressions of unequal heights and depths. Before being introduced in this bath, however, a reinforcing strip is applied to the film.

This strip resists the effect of the water and provides a permanent backing for the metallic sound record so that the soluble gelatin, in going into solution, does not leave it without support.

The numbers on the two positives enable them to be registered, when their margins are permanently attached to each other and a single wide strip formed. One side of this composite film is passed before an arc and its images projected on a screen in the conventional manner. Rendition of the sound record, on the other hand, is accomplished by passing it between the poles of an electromagnet. The principle involved corresponds to that of the telephone. Variations in the amount of the metallic deposit produce fluctuations in the intensity of the magnetic lines of force that pass through the film. Included in the circuit are amplifiers and a loud-speaking telephone which, when used in a theater, would be installed behind the curtain or adjacent to it. The magnetic pulsations are amplified and carried to the enunciator, which translates them into audible words and sounds. In this comparatively simple manner are sound and motion synchronized and talking pictures produced.

Refreshment Booths on a Railway Platform in Mexico, Where Travelers Eat Their Meals While the Train Waits

CRUDE BOOTHS TAKE PLACE OF DINERS IN MEXICO

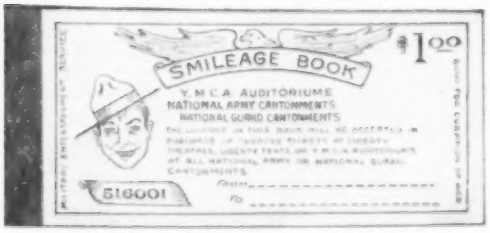
Dining cars being unknown on certain railways along the west coast of Mexico, crude booths are provided on various station platforms, where food is served. They consist of loose pieces of canvas supported by poles, beneath which are tables and chairs. The trains wait while the passengers eat the none-too-appetizing fare.

CORRUGATED CEMENT USED FOR ROOFING PURPOSES

England's efforts to conserve steel and iron have resulted in the development of an asbestos and cement material that is being used instead of corrugated iron for roofing purposes. It is made by mixing one part of finely ground asbestos to six parts of Portland cement. When made into paste by the addition of water, it is rolled into sheets which, after being trimmed, are corrugated and then seasoned. The asbestos serves as reinforcement. Durability, resistance to acid-laden atmosphere, its fireproof qualities, and its low conductivity of heat are advantages claimed for it.

"SMILEAGE BOOKS" TO MAKE SOLDIER LADS HAPPY

"Smileage Books"—as they have been humorously labeled—containing coupons that can be exchanged for entertainment tickets, have been issued by the Commission on Training Camp Activities for men in the various camps and cantonments. Books made up of 20 coupons cost $1, and those having 100 coupons, $5. They are most acceptable presents for soldiers and are honored in any camp in the country in the purchase of tickets at Liberty theaters and Y. M. C. A. auditoriums.



Book of Coupons for Soldiers' Entertainments: These will be Honored at Any Liberty Theater or Y. M. C. A. Camp Auditorium in the Country

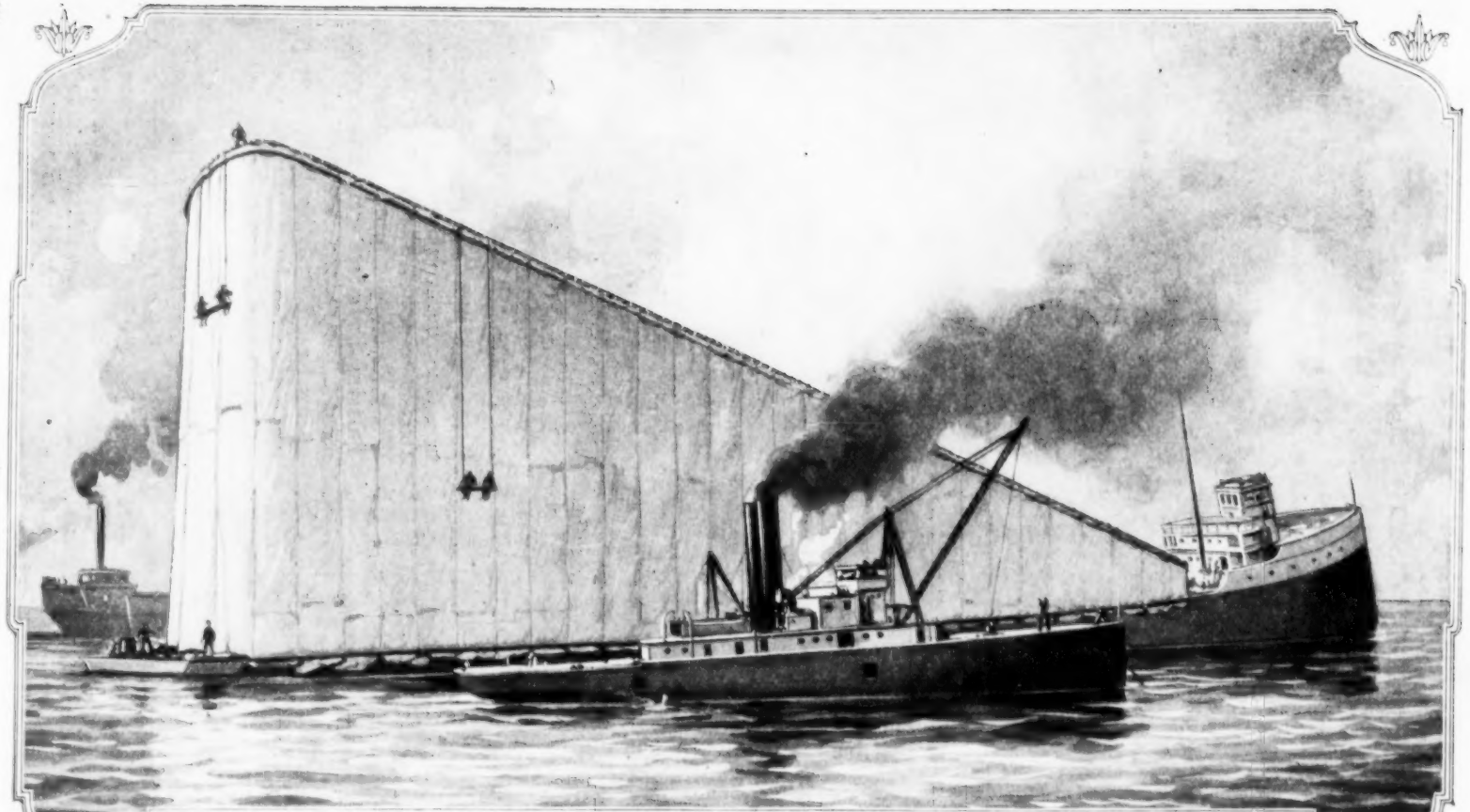
MOTOR CAR MISSES BRIDGE AND LEAPS INTO RIVER

At a speedy clip the road from gayety to tragedy was covered in Montana a short time ago when a motor car, bearing 11 young men from a dance, missed an unlighted bridge, plunged down a steep embankment, and wedged itself beneath the trunk of a fallen cottonwood tree in the river below. The automobile was wrecked, the driver killed, and several of the passengers seriously injured.

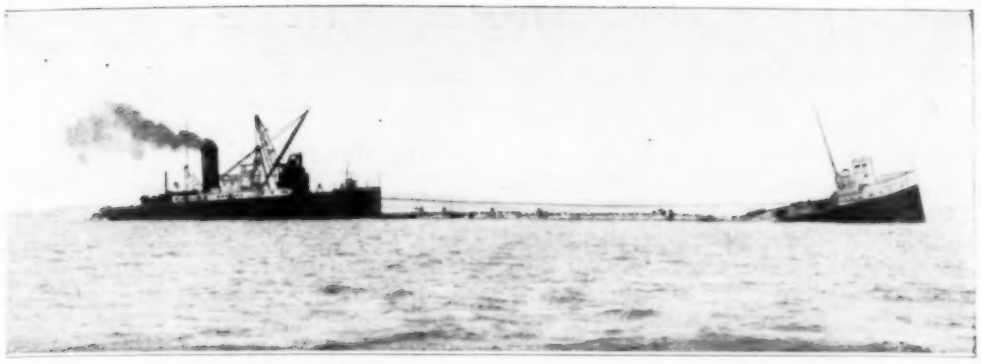
The Driver of the Car was Killed and the Rest of the Occupants More or Less Seriously Injured

NITRATE SOLD TO FARMERS AT COST BY GOVERNMENT

Through the secretary of agriculture the government has purchased 100,000 tons of Chilean nitrate for fertilizer, to be sold to the farmer at cost. This big business deal of the government's, giving the farmer the benefit of purchase by wholesale, or better, is made possible by a provision in the Food Control Act that authorizes the president to purchase nitrate of soda for the improvement of the land. The secretary has ruled that the fertilizer will be sold only to farmers for their own use during the coming season and generally not in excess of amounts used heretofore. The purchase was made in coöperation with the Shipping Board and the War Industries Board.



As the Canvas-Covered Cofferdam Appeared When Enough Water had been Pumped for the Vessel to Float to the Surface: The Full Height of the Timber Structure Is Visible and by Following the Gunwale Line the Exact Outline can be Distinguished. The Steamer Is 416 Feet in Length and When Wrecked Carried a Cargo of 7,000 Tons of Coal. The Ship and Its Load were Salvaged Together After Many Difficulties had been Surmounted



Showing the Angle at Which the "Western Star" Settled into the Lake after Striking the Rock: The Wrecking Tug Is Alongside and Part of the Great Cofferdam in Place

WRECKED VESSEL INCREASES IN VALUE

By GEORGE F. PAUL

IT is not very often that a vessel can hang for two bitter winters on a rock in one of the Great Lakes, battling bravely against the waves to retain its hold, then come serenely into port some fine day with a valuation of $358,000, against the $240,000 for which it had been insured when the accident occurred. This is what happened in the case of the "Western Star."

It was on a misty morning, Sept. 21, 1915, that the "Western Star," laden with 7,000 tons of coal, was cautiously feeling its way up the north channel of Georgian Bay. The ship was not far from Clapperton Island when Captain Sloan suddenly saw and felt, as did the crew, that something was decidedly wrong. It was a moment for prompt action. The boat was aground on the treacherous Robertson's Rock, long the dread of many a mariner. The boats were speedily lowered, but not a moment too soon, for the "Western Star," helpless with the enormous cargo that she carried, speedily settled at an acute angle, tipping her nose high in air and leaning back serenely in the lake as if she were tired of her 12 years of service on the Great Lakes and now was looking forward to

Bow View of Heavily Laden Freighter on Its Way to Port Two Years after Sinking in Georgian Bay

nothing more ambitious than a good long rest.

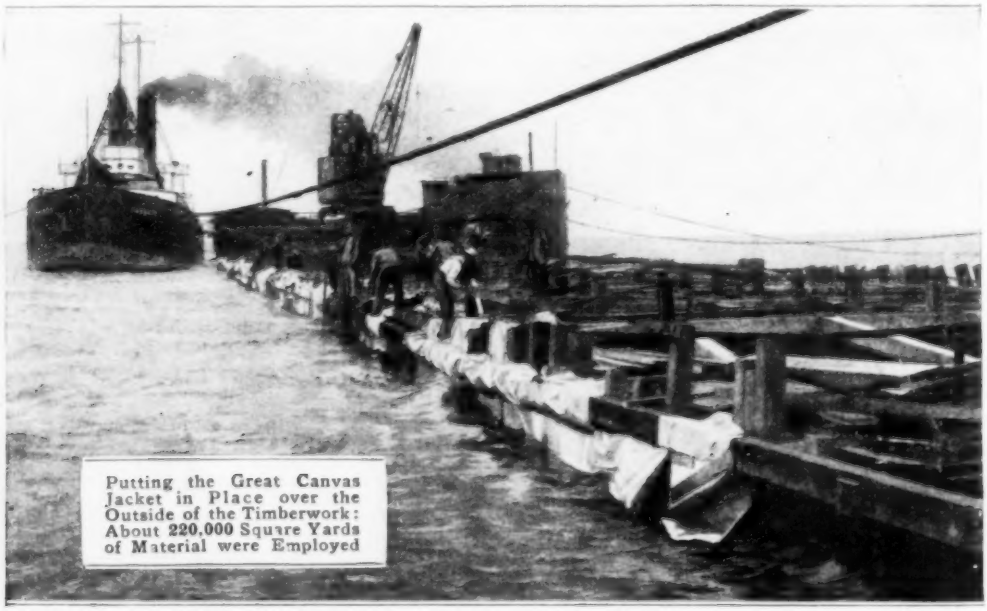
It was with many regrets that Captain Sloan and his officers, with their crew of 20 men, finally pulled away from the derelict and reached the shore in safety. The owners of the vessel came, examined the wreck, shook their heads, and were glad to hand it over to the underwriters. They in turn awarded the salvaging contract and the rescue work was begun. The first thing was to construct a cofferdam through the ice. This was an enormous undertaking, but it was hurried through to completion and the steam pumps were put to work, and then—well, the unseasoned timbers gave way under the tremendous water pressure and the work of weeks proved just that much dead loss.

Finally in June, 1917, the wrecker "Favorite" and the lighter "T. F. Newman" returned to the "Western Star"; they were loaded with all kinds of first-aid as well as permanent-aid materials. Then the work began.

First, stout timbers, some of them more than 60 ft. in length, were let down, then securely riveted to the gunwale bar. A 1-in. facing was used on the outside to support these timbers and over this facing was drawn a great water-tight canvas jacket. A stringer, 12 in. square, was run around the top of the timbers on either side. Deck beams and sawbucks helped to make the structure more substantial. Just as the cofferdam was nearing completion, the elements seemed to league together to prevent the rescue of their prisoner. Under the leadership of the northwest wind, they swept over Georgian Bay and gave the cofferdam a severe drubbing. As a result of this tilt, it had to be practically reconstructed.

Then came fair days. The waves died down. The surface of the lake shone like plate glass, and the workmen made haste to complete their cofferdam while the sun shone.

Theirs was no holiday job. In fact, they were working on what is believed to be the largest cofferdam of its kind that has ever been put into successful operation. A small forest of timber was needed to supply the 430,000 ft. used. Something like 150,000 lb. of metal went into the strut rods, and as for the giant canvas, it would be the finest thing in the world to cover three or four football gridirons with and keep them snug and dry, and it could do it, too, for its figures showed a total

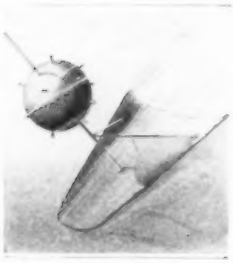


Putting the Great Canvas Jacket in Place over the Outside of the Timberwork: About 220,000 Square Yards of Material were Employed

of 220,000 square yards. On Sept. 18, 1917, two years after the wreck, the "Western Star" was finally towed into a Canadian port, where the rest of the pumping was done. The vessel is a steel ship of 4,764 gross tons, 416 ft. in length, 50 ft. in width, and 26 ft. in depth.

SEAPLANE DRAG BOMB NEW U-BOAT DESTROYER

To effect the destruction of submerged submarines sighted by sea-patrolling flying boats, the use of drag bombs has been proposed. Such a device, the subject of a recent patent, consists essentially of a contact mine and inclined deflecting plate connected at one end of a long cable, the other end of which is fastened to a seaplane. The winged boat, when operating offensively, would navigate on the water's surface. By crossing above an enemy craft and pulling the bomb against the submerged hull, the detonation of the one and the destruction of the other would be accomplished. The purpose of the deflecting plate, which is inclined downward, is to prevent the cable-drawn mine from tending to rise to the surface as it is pulled rapidly through the water. Several flying boats thus equipped would be directed in their attacks by the signals of airmen aloft.



HEROIC FIGURES FEATURED IN RED CROSS DRIVE

Figures of heroic size, representing a wounded United States soldier and a Red Cross nurse, were a conspicuous publicity feature in the recent Red Cross drive in Boston. The statues were moved from point to point along the Lafayette Mall, each advance indicating an addition of 10,000 members. The soldier stood 18 ft. high and the nurse 16 ft. high. The figures were of papier-mâché on a steel framework,

Huge Figures Whose Movement along a Boston Street Indicated the Progress of a Red Cross Drive

and were garbed in cloth uniforms. Rollers, partly concealed by boughs, made the moving of the exhibit comparatively easy.

FORESTERS' SIGNAL TOWER OVERLOOKS VAST AREA

Forest rangers in Canada have recently completed a steel signal tower in southern Quebec timberlands which serves as a lookout during the day and is used at night for sending warnings across nearly 500,000 acres of forest. A powerful revolving searchlight is located at the top and is provided with a mechanism by which signals can be flashed, according to code, to indicate the location of fires in the timberlands.

HAND-PRINTED BIBLE WORK OF CANADIAN CHURCHMAN

After several years of laborious work accomplished at odd moments, a Montreal man has completed a pen-printed bible. The task was begun in 1894 and concluded a short time ago. One thousand nine hundred and eighty-seven gilt-edged pages are contained in the leather-bound volume, which is 12½ by 10 by 4 in. in dimensions. It is a rather interesting fact, also, that the book bears silent evidence of the world war. More than half of it was unfinished in August, 1914. War conditions thereafter made it impossible to obtain paper of the same quality as that previously used. Therefore the last part of the book is on stock that has a slight yellowish tinge.

The Hand-Printed Bible and Its Elaborately Penned Title Page, the Work of a Canadian Scriptural Student: It Contains 1987 Pages and although Begun in 1894 It has Only Recently been Completed

---

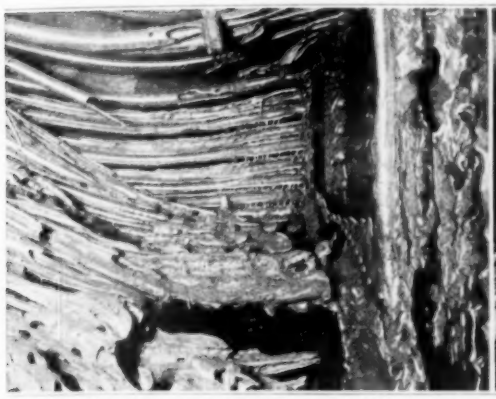
¶Investigators having recently found extensive undeveloped coal fields in Serbia, there is reason to hope that this country may some day become a great fuel producer.

MANY PARCEL-POST ROUTES TO USE MOTOR TRUCKS

One of the biggest steps yet taken in the introduction of motor trucks as a city-to-city carrier results from the decision of the Post Office Department to establish numerous parcel-post motor-truck routes. These have already been surveyed and aggregate between 3,000 and 4,000 miles in length. One chain of routes extends from Portland, Me., to New Orleans, and another through the middle-western states, while still other routes connect principal cities on the Pacific coast. It is hoped that the operation of these routes and of others to be established will materially aid in the distribution and in the lowering of the cost of food products. The government has already advertised for bids for operating the new routes, and in case the proposals received are not satisfactory, the plan is to install government-owned motor trucks, operated by men in Federal employ.

FAST INTERURBAN JOURNEY MADE BY FIRE ENGINE

In days not so long past, when steam fire engines were generally used, it sometimes required as much as an hour to make up a special train with which to carry fire-fighting apparatus from one city to another that had sent in a call for outside help. By way of contrast, Niagara Falls, N. Y., recently sent in an emergency fire call to Buffalo and almost instantly an engine, driven by a six-cylinder gasoline motor, was speeding to the fire. In spite of the fact that it had to travel through congested city streets at the outset, it made the journey of 24 miles in 45 minutes.

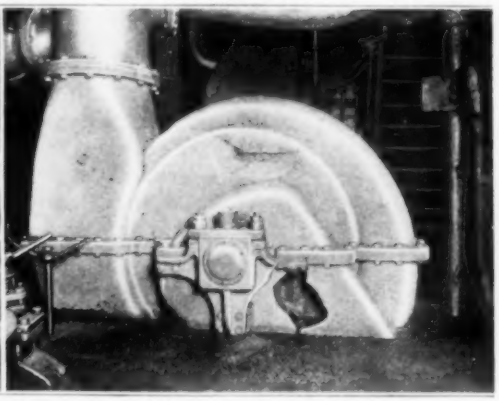


COPYRIGHT, COMMITTEE ON PUBLIC INFORMATION

Result of Dry Firing and Probable Use of Thermit Aboard the "Pommern," Showing Boiler Tubes Melted Down by Intense Heat

ALL SHIPS HUNS DAMAGED NOW IN U. S. SERVICE

Despite all of the efforts made by their crews to render them useless, nearly a hundred formerly interned German ships are now flying the Stars and Stripes in the service of the United States navy. Details of the injuries inflicted and the progress made in repairing them have been announced. It develops that although the Huns were convinced their vandalism made our use of the boats impossible, the navy has not only managed to repair all of them but has done the work so skilfully that in no case has failure or weakness since developed. A memorandum found on one of the boats enumerates what was done to cripple it permanently. After almost every notation appear the words: "Cannot be repaired." In addition to melting boiler tubes and injuring furnaces by dry firing and the use of thermit, cylinders, valve chests, circulating pumps, and similar parts were smashed with battering rams and sledges, and pistons, connecting rods, and stays sawed in two by the Germans. Fire extinguishers were filled with gasoline, incendiary preparations made, and gauges reversed. Steam pipes were plugged by disjointing them, driving in slugs of solid brass, and then concealing the work by renewing the connections.



The Work of Sledges or a Battering Ram on a Circulating Pump: Repairs have been Made by Electric-Welding Methods

STEAM SHOVEL EMPLOYED TO ERECT SMOKESTACK

A steam shovel of the type used in railway construction was employed to very good advantage not long since in erecting a metal smokestack. The flue was 70 ft. long, weighed 5,000 lb., and had to be lifted up onto a foundation 12 ft. high. A wooden extension 18 ft. long was added to the boom so that the stack could be grappled near its middle and swung into an upright position. The work of setting up the flue and securing it with guys was done by four men, including the operator of the digger, and occupied just two hours. There is some risk involved in lifting a heavy load with a boom to which an extension has been added but here proper precautions were taken.

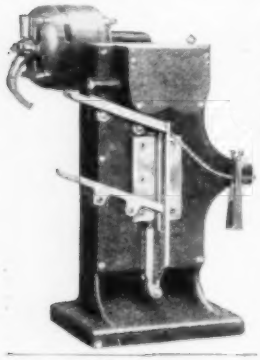
Steam Shovel with an Extension Attached to Its Boom, Engaged in Erecting a 70-Foot Smokestack

BUFFER POST CAMOUFLAGED AS GIANT GUN SHELL

Brick and stone buildings almost everywhere are protected at alleyway corners by projectile-shaped steel guards that prevent them from being damaged by the wheels of carelessly driven vehicles. One of these devices recently caught the attention of an imaginative fellow who had plenty of time and was handy with the camera and stylus. Such is the history of the accompanying illustration, which shows the corner of a building shattered by a 42-centimeter shell that ostensibly ascended through the earth from somewhere in China.

POWER SPACE-BAND CLEANER NEW PRINT-SHOP DEVICE

Much labor and time in the composing room are saved by an apparatus that has lately been designed for cleaning the space bands of linotype machines. Such work, heretofore a tedious hand operation, requires daily attention, for unless the members are kept free from metal and are properly treated with graphite, unsatisfactory work and deterioration of the mechanism result. The device is electrically driven and supplied with polishing rollers that fit the slight concavity of the bands and hold them against injurious side movements. A set of justifiers is thoroughly cleaned and treated with graphite in about 35 seconds.



DECORATED SHAFT SERVES AS CHRISTMAS TREE

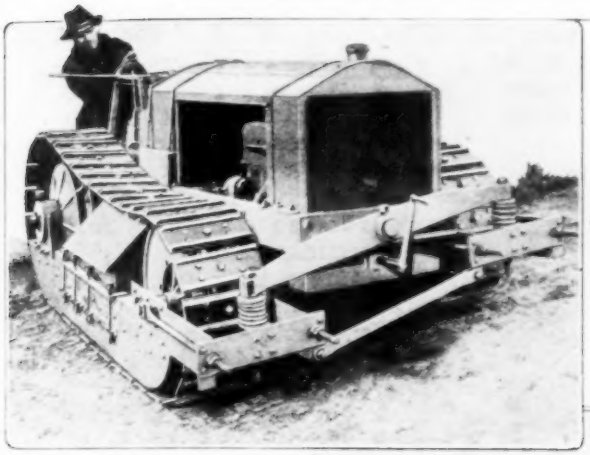
A distinctive substitute for a municipal Christmas tree was erected in Buffalo, N. Y., by enshrouding all but the top of the McKinley monument in evergreen boughs. The shaft stands 70 ft. high and the branches were arranged to resemble a giant fir. The holiday emblem was brilliantly illuminated with many electric lights.

HEAD SCREEN IS LATEST DEVICE FOR CYCLIST

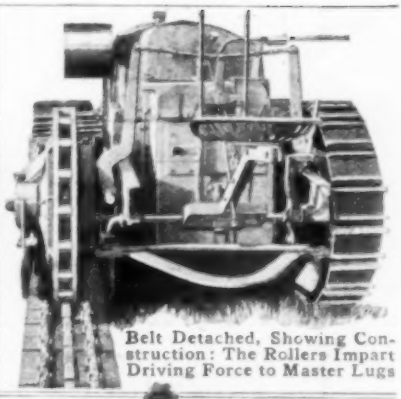
A novel accessory for the motorcyclist has appeared in England in the form of a head screen that is worn like the headpiece of a diver's suit. The front portion projects in the form of a wedge, its sides being fitted with celluloid panels through which the wearer obtains an excellent view. The remainder of the article is made of loosely woven wire mesh.

LOG-CHAIN PRINCIPLE USED FOR CREEPER TREAD

One of the interesting features of a sturdy farm tractor of recent development is its creeper tread, which is built on the old log-chain principle. In addition to long life and a capacity for hard use, it has the advantage of being



Compact and Powerful, the Tractor is Built to Go Wherever Work is to be Done. It Handles a Four-Share Plow with Ease



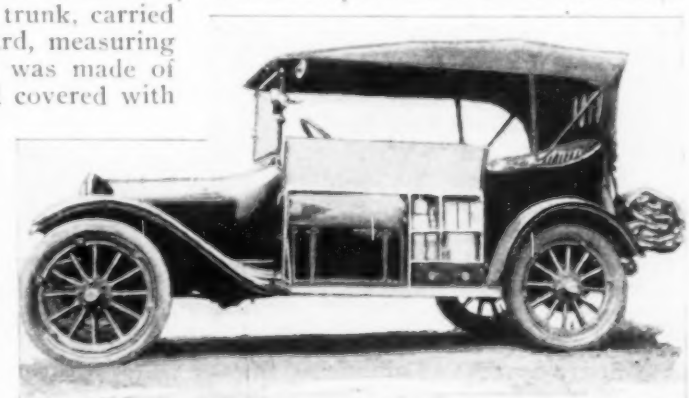
Belt Detached, Showing Construction: The Rollers Impart Driving Force to Master Lugs

One Man can Operate both Tractor and Implements. Here a Five-Year Stand of Timothy Sod is being Broken

easily repaired. Each link and grouser plate may be detached and replaced quickly, if necessary. Unlike most other endless-belt treads, this one does not require lubrication. The tractor mounts a four-cylinder engine that employs a kerosene-gasoline mixture for fuel and develops 52-brake horsepower. It has two speeds forward and reverse, turns in a 12-ft. circle, and handles a four-share plow with ease.

THIS MOTOR CAR EQUIPPED FOR MANY CAMP NEEDS

A principal feature in an auto touring outfit which has been used in motoring through the entire Southeast this past winter, was a trunk, carried on the left running board, measuring 12 by 26 by 50 in. It was made of three-ply basswood, and covered with enameled cotton duck. A lighter trunk for clothing, measuring 10 by 18 by 33 in., was carried in the larger container. Other articles in the list of contents were an air mattress, a camp stove, aluminum camping outfit of 51 pieces, aluminum coffee pot, and six boxes for groceries and meats. A tent and bedding were carried at the rear. On the right running board were stored camp chairs and additional bed-



Amply Equipped Car in Which a Party has Toured Many Thousand Miles: An Unusually Spacious and Conveniently Arranged Trunk is Shown on the Running Board

ding. Other articles for which places were found were a repair kit, an ax, a folding spade, a jack, suitcase, desert water bag, camera, gun, and fishing tackle.

CAMOUFLEUR'S ART USED TO CONCEAL FOUNTAIN

A decided transformation of a familiar landmark in New York City—a fountain in City Hall Park—was ef-

Side View of the Papier-Mâché Pedestal, and the Fountain Which It Partly Concealed. Inset: Front View Showing How a Familiar Landmark was "Camouflaged" as a Marble Monument

fected at moderate cost in connection with a recent local celebration. From one point of view the fountain was hidden by a pretentious-appearing monument, designed especially for the occasion. Viewed from the front it appeared to be of carved stone, but closer inspection showed that it was only a shell of papier-mâché. From the side the wooden braces and unfinished edges come into view dispelling any illusion that one may have had about the monument's permanence.

CONCERN BUYS AND SELLS SECONDHAND RAILWAYS

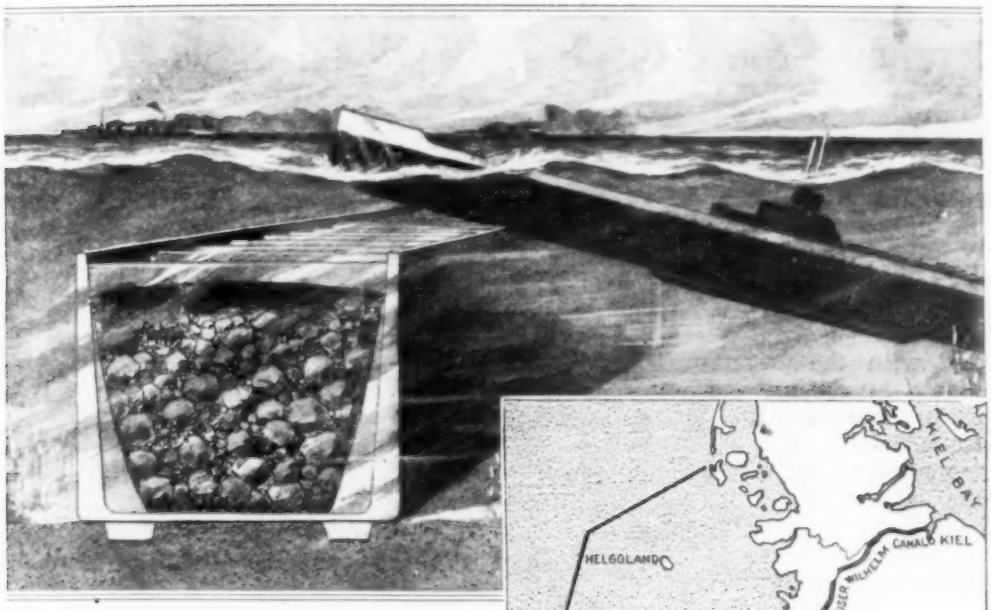
Junking railroads has become the regular business of at least one firm—a concern in a middle western city—since the war began to raise the price of metals and so to make profitable the sale of secondhand railway equipment. Much of the rolling stock and other material obtained from short lines, abandoned wholly or in part, has been sold to Russia and Central American states.

The firm referred to was formerly in the general junk business in a small way, but, in response to an advertisement, purchased at auction a railroad in Iowa consisting of 43 miles of track, engines, cars, etc. On obtaining permission to dismantle the line, a large part of the movable effects were sold to Russia, while the balance of the iron and steel went to an eastern manufacturer. The right of way was given to farmers whose land adjoined the railroad.

The profits from this venture were so substantial that the firm gave up its regular junk business and went into the career of buying railroads. The locomotives remaining on the lines which it acquires are usually employed in drawing the outfits sent out to tear up the tracks. These are the same as used in track laying, the operations merely being reversed, so that as the wrecking train withdraws it leaves practically nothing in its path.

UNDERSEA WALL TO KEEP SUBMARINES FROM OCEAN

To protect the high seas against German submarines, a Scotch engineer comes forward with a daring proposal that is interesting if for no other reason than its sheer stupendousness. He presents plans for the construction of an enormous underwater wall that would extend from the Friesian Islands to a point off the coast of Schleswig, 80 miles distant, and pass well to the westward of Helgoland. Such a structure would block the exits from Wil-



Cross Section of the Antisubmarine Wall, Showing Certain Details of Its Construction and the Potential Effect of Its Installation on Enemy Boats

The Proposed Barrier would Extend between the Points Indicated on the Map and Prevent U-Boats from Reaching the North Sea

helmshaven, Cuxhaven, the Kaiser Wilhelm Canal, and neighboring bases, and prevent naval vessels of all kinds from reaching the ship lanes in the North Sea and Atlantic Ocean.

Because the North Sea is comparatively shallow along the line of the proposed barrier, the plan is possibly feasible so far as its engineering aspects are concerned. The wall would be built of reinforced concrete in about a thousand bargelike sections which would be towed to the proper positions, filled with stone, and sunk end to end. These segments would vary in some of their dimensions so as to meet the conditions presented, but for the purpose of description they would be about 400 ft. long, 80 ft. wide, and 100 ft., or less, in depth. The top of the wall thus formed would be some 10 or 12 ft. below the surface of the water. This, in addition to minimizing the effect of heavy waves during severe storms, would conceal the barrier sufficiently to hamper the enemy in his attempts to break through it.

Because of the sandy character of the bed of the North Sea, and the strong tidal movements, the units would need to be firmly anchored against lateral displacement. This, the engineer would accomplish by providing long, deep cleats, on the bottom of each unit, which would settle into the sand and stabilize the structure.

Great obstacles would have to be overcome in carrying out such an elaborate scheme in the face of war conditions. To the allied navies would fall the task of protecting the work during its construction and afterward. It is obvious that the wall would require constant patrolling and that occasionally it would demand repairs, but, if properly defended, it would, the inventor believes, prove impregnable. The cost of construction would be heavy, but perhaps not prohibitive, providing the desired results were accomplished. The plan has been submitted to the British Admiralty for consideration.

OUR BRITISH-AMERICAN SERVICE RIFLE

By EDWARD C. CROSSMAN

WHEN the draft army slips aboard the swarming transports, the infantrymen will carry rifles of a model never seen in this country up to the present writing. Caught with an entirely inadequate supply of rifles on hand and with the arsenals at Springfield, Mass., and Rock Island, Ill., too small to make the rifles fast enough to fill the gap, the government turned to the giant arms plants of this country which had been making rifles for France and England and Russia. The British Enfield, model 1914, was selected as being the best; it was hurriedly changed in design to handle our army cartridge, and then the great plants of the Remington, the Midvale, and the Winchester companies were set to grinding out the new rifle, at the rate of about 3,500 per day for the total.

Old and New Rifles of the British and American Forces: In Order from Top to Bottom They Are, the Lee-Enfield, the Enfield Model 1914, or United States Model 1917, the New Springfield, and the Krag-Jorgensen

The new rifle, used merely to supplement our service rifle, is much like the new Springfield, our own rifle, and like that rifle, is based on the Mauser. It is clip-loading, holds six cartridges in the magazine, and has the same rate of fire, about 25 shots per minute. The barrel is 26 in. long instead of 24, as is the Springfield, and it weighs about ¾ lb. more than our rifle. The chief difference is the rear sight, which on the new U. S. model 17, as the rifle is called, is set well back on the receiver bridge—the portion of the frame just forward of the grip of the rifle—instead of on the rear end of the barrel as on the new Springfield. It has only a peep sight, which gives much the same optical effect as the peep sights on sporting rifles, and lets the soldier see "the whole country" around the thing to be hit. Because the peep is close to the eye it can be quickly caught by the soldier in aiming, and he has only to consider the front sight and the

The Location of the Rear Sight Nearer the Butt Is an Important Difference between the 1917 Model, the Lower of These Two, and the New Springfield, above It

The New Weapon for Our Drafted Army: It has a 26-Inch, Instead of a 24-Inch, Barrel, as Has the New Springfield, and Weighs Three-Fourths of a Pound More Than That Weapon. It Is Clip-Loading and Holds Six Cartridges in the Magazine

thing to be hit. Our own service-rifle sight is unsatisfactory in that it has too many notches and peeps, and stands too far from the eye, taking away the advantages of the peep.

The sight on the new rifle is self-locking to any range, and is graduated to only 1,600 yd. instead of 2,850, like the Springfield. This does not mean that the range is any shorter, but that army authorities find that 1,600 yd. is the limit at which effective infantry fire can be delivered.

Other differences are that the new rifle cocks as the bolt is closed instead of as it is opened, like the present German Mauser and our Springfield, which is nearly a copy thereof; it has a semi-pistol grip, the bolt handle is turned backward more than on the Springfield; there is no magazine cut-off, and the safety is mounted on the receiver on the right-hand side instead of on the bolt, like the safety of the Mauser, Mannlicher, Krag, and Springfield.

It is a good rifle, equal to the Springfield in many ways, and superior in the matter of sighting. When it is put into the hands of the draft army, now struggling along with about one old-fashioned Krag for every five men, the men will have less difficulty mastering it than they would our own Springfield rifle.

BURN LOCOMOTIVE CINDERS IN GERMAN POWER PLANT

There has recently been completed at Frankfort on the Main, Germany, what is said to be the first large railroad power station to be operated entirely on locomotive cinders. Three boilers are fired by automatic underfeed stokers and burn cinders, alone or mixed with coal dust. The cinders are brought on a traveling electric crane directly into the boiler room. Steam produced with this fuel is employed to drive two turbines that generate current for the light and power systems in the station.

¶ The Federal government is censoring motion-picture films prepared for exportation to prevent the transmission, by this means, of anti-American propaganda or any information that might be of value to the military forces of our enemies.

USE OF TRACTOR MAKES HOUSE MOVING CHEAP

A creeper-tread tractor was employed in moving a 22-ton California dwelling a mile recently and accomplished the task in surprisingly quick time, the job

A 45-Ton Creeper-Tread Tractor Engaged in a Moving Job That Occupied Only 30 Minutes and Cost Less Than Ten Dollars

occupying only 30 minutes. The cost of doing the work, including the placing of four big sets of rollers under the structure and setting it on the new foundation, was less than ten dollars.

DECORATED SLED EQUIPPED WITH A PHONOGRAPH

A lover of children recently constructed a novel sled that proved an especial delight to little folks because

A Gayly Decorated Sled Having a Phonograph Installed under the Seat: Wheels are Concealed on the Inner Sides of the Runners for Use When There Is No Snow

its canopy and framework were profusely decorated with colored plumes, fringes, and festoons, while concealed beneath the seat was a small phonograph that could be played when the sled was moving or standing still. The instrument was connected with a horn overhead by a hollow upright.

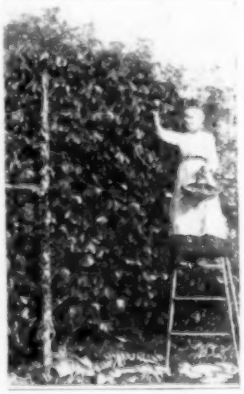
¶The importation into the United States of yams and sweet potatoes from certain of our island possessions and foreign countries has been prohibited for the purpose of keeping out the sweet-potato weevil and sweet-potato scarab which are prevalent there.

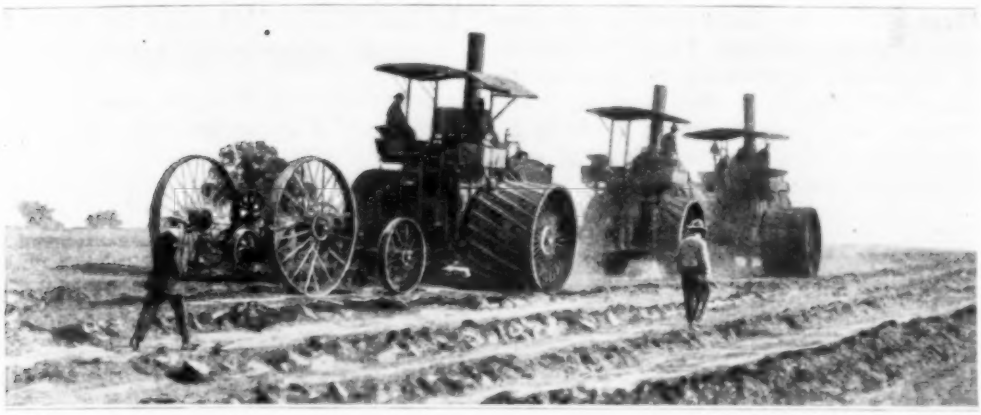
PAN-AMERICAN TRADE-MARK PROTECTION PROBABLE

By the inauguration of the International Registration Bureau at Havana within recent weeks, an important stride has been made in establishing trade-mark protection throughout the American hemisphere. The next move will be an attempt to bring about the creation of a similar bureau at Rio de Janeiro for continental South America. This involves the ratification, by two-thirds of the countries, of the treaty signed at Buenos Aires in 1910. The Havana bureau has jurisdiction over the northern group of republics, all of which, with the exception of Mexico, Salvador, and Haiti, have agreed to the convention. It will be supported on a pro-rata basis and operated under the direction of the Cuban government in consultation with the United States patent commissioner, the director of the bureau, and analogous officials in other countries affected. The eventual establishment of the Rio de Janeiro bureau will serve the same function for continental South America. The two offices by exchanging registration entries will provide a complete service.

FIVE TOMATO VINES COVER NINE-FOOT TRELLIS

Not having sufficient yard space for an ordinary tomato patch, a California woman erected a V-shaped trellis, 9 ft. high, in an area measuring 3 by 8 ft., in which she undertook intensive gardening. Five tomato vines were planted which grew over the top of the support, some of them almost reaching the ground on the other side. For over four months fine tomatoes were harvested from these vines.





THREE POWERFUL TRACTORS PULL SUBSOIL PLOW

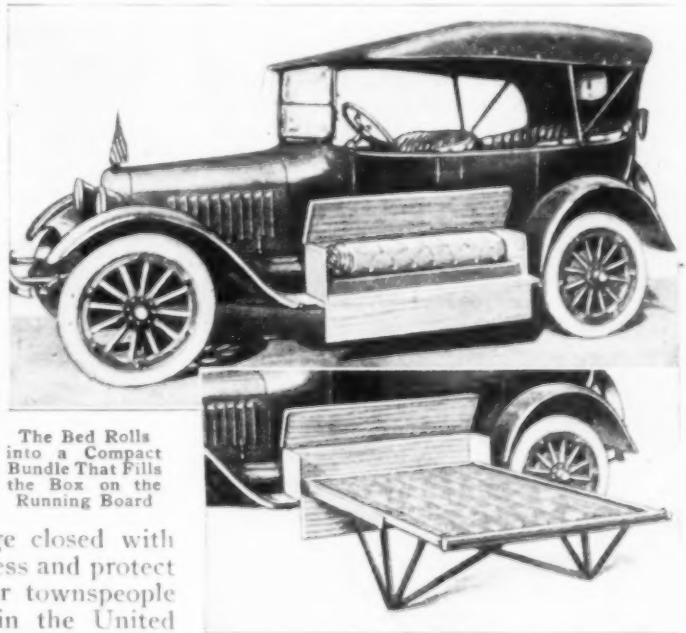
IN the February issue of this magazine a description of a giant plow built for breaking hardpan to a depth of 48 in., was carried. The accompanying illustration gives a striking view of one of the big machines in actual use. It is being pulled by three 110-hp. steam tractors. As will be recalled, the shares are arranged in line, the first one reaching 16 in., the second, 32 in., and the third, 48 in., into the ground.

TOWN CABLES GREETINGS TO SON IN FRANCE

Not long ago an American, Raoul Lufbery, in the French flying service, whose repeated victories over enemy fliers won for him the coveted title of an "ace," was made a major in the American army, and in recognition of this fact the soldier's home town in Connecticut sent him a cablegram of congratulation, signed by the warden of the borough. It is not difficult to imagine the thrill which this happily conceived message produced in the heart of the distinguished young fighter, nor can its value as a stimulus to greater service be overestimated. The message closed with the words, "May God bless and protect you, is the wish of your townspeople and of all the people in the United States." The incident offers a timely suggestion to other communities whose sons are destined to win military honors.

OBLONG CASE ON RUNBOARD CARRIES MOTORIST'S BED

Compactness is one of the advantageous points of a collapsible bed that has been devised for touring motorists.



The Bed Rolls into a Compact Bundle That Fills the Box on the Running Board

Opened Out It Forms a Comfortable Bed for the Motorist Who Lives Outdoors While Touring

The frame folds, and the combination mattress and spring rolls, into an

oblong box made fast to one of the running boards of a car. Only a moment is required for opening or closing it. The mattress is in reality a canvas-covered cotton pad supplied at six-inch intervals with chains attached at opposite ends to springs.

SPINELESS CACTUS HELPS SOLVE FOOD PROBLEM

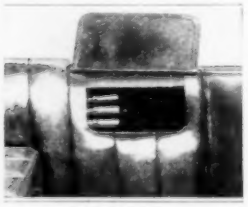
The growing of spineless cactus, whose food value is now well-known, has become an increasingly important

Picking Fruit in a 20-Acre Field of Spineless Cactus in the Southwest

industry in the Southwest because war conditions are demanding the development of every available source of food. The fruit of the cactus, known as tuna, is eaten raw or preserved. A not uncommon practice is to peel the young shoots and fry them in batter or dip them in sirup to make a confection.

POCKETS IN AUTO TONNEAU HOUSE SIDE-CURTAIN RODS

A convenient pocket for the storage of automobile side-curtain supports is provided in the sides of the tonneau upholstery. The rear of the pocket has a block with four holes which serve as sheaths for each of the rods. Small spring clips prevent the rods from rattling or turning.

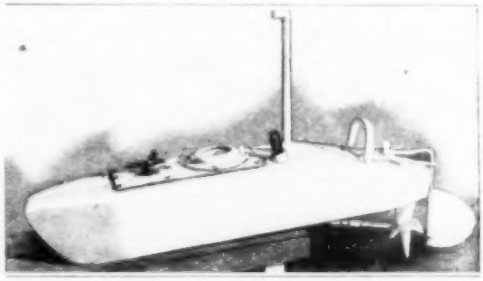


FREE EMPLOYMENT BUREAU FOR MEN CALLED OLD

Believing that the community whose employers decline to hire men approaching 50 years of age, suffers a great economic loss, an association of Chicago employers has established a free employment bureau for men past 45. During the bureau's first year, which has just closed, jobs were secured for 9,190 men, the aggregate of their wages being $2,000,000 for the year. The agency believes that it has demonstrated that gray hairs are not an indication of inefficiency.

TINY BOAT CARRIES FISH-LINE TO DEEP WATER

Quite the strangest of all fishing accessories is a diminutive electric vessel designed perhaps more as a novelty than for practical purposes. It is 3 ft. long, of light weight, and in appearance bears some similarity to a submarine. It is intended to carry a line out to sea for a fisherman stationed ashore. It is not made clear that the boat has ever performed the function,



The Clock-Dial Regulator, Mounted on the Deck, Provides Automatic Control for the Little Seagoing Vessel

but by setting a clock-dial regulator it is said the mechanism may be made to stop operation after the craft has covered any distance up to about a mile. When the predetermined point is reached, the line is released and the boat returned to shore by reeling in a cord. If it then follows that a fish swallows the hook on the line, it is pulled in similarly.

AERIAL CHASE IS SPORT ROYAL FOR CLUBMEN

Shooting Toy Balloons from an Aeroplane, a Sporty and Absorbing Diversion Practiced by Members of Two Los Angeles Clubs: It Combines the Thrills of Flying, the Enjoyment of Shooting, and the Excitement of the Chase

Toy-balloon shooting in the clouds has entered the arena of American sports as an exhilarating and dignified diversion for leisurely gentlemen of means and red-blooded tendencies. Its introduction has been made in southern California under the auspices of the Bolsa Chica and Los Angeles gun clubs, some of whose members are its first patrons and devotees. Balloon shooting is accomplished with the aid of aeroplanes, and reduced to its last analysis amounts to an ultra-modern adaptation of the English hunt, and might fittingly be called an aeronautical chase. Bright-colored balloons as large as bushel baskets are released at the ground in bunches of about 25 and pursued through cloud banks and clear expanses by gunners in pusher planes. Thus the thrills of flying, the sport of shooting, and the excitement of the chase are combined in one high-speed pastime. The Los Angeles clubs have acquired the services of a professional airman and his three machines for the purpose of determining the possibilities of the idea. The first time it was tried out a man, who uses the pump gun effectively on clay pigeons, "bagged" 14 out of 25 balloons in 50 shots. The others escaped. The sport may appeal strongly to our returned airmen when peace is eventually restored.

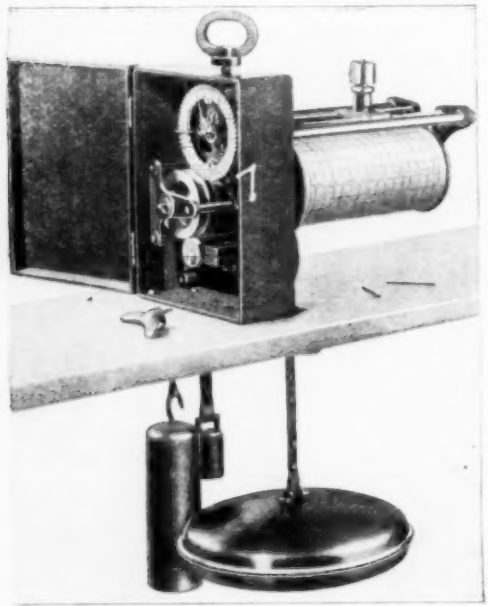
BRITAIN'S NEW RULE GIVES WORKERS MORE FREEDOM

Wage earners and employers in England are watching with a good deal of interest the results of the recent abolition of the leaving-certificate system. This system was established by the British government in 1915 to prevent disturbing fluctuations of the labor market in shipbuilding, munition making, the engineering shops, etc., and it provided that a workman could not leave an employer without obtaining a permit. With labor conditions more stable, it was found that industries essential to winning the war could be made more efficient. Before this rule was es-

tablished certain employers had sought to check the migration of labor in various ways, but the methods employed had generally caused keen resentment by the men. Now that the latter have regained their freedom to change employers, after giving only a week's notice, there is much speculation as to whether conditions will remain stable.

CLOCK-DRIVEN REGISTER SHOWS WATER LEVELS

Special merit is claimed for a water-stage register now on the market because of its simplicity, accuracy, and



A Graphic Water-Stage Register Operated by a Weight-Driven Clock: It can be Set for One, Four, and Seven-Day Periods

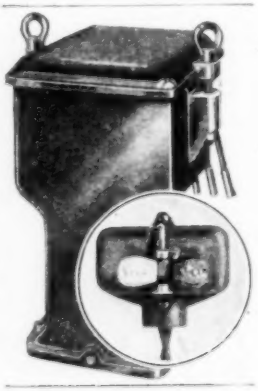
low maintenance cost. A graphic record of the water's level is made automatically with a pencil on sheets plotted for a given period and mounted on a horizontal drum. The rise and fall of a float in the water below the instrument causes the drum to rotate back and forth. At the same time the pencil travels from one end of the cylinder to the other in the given period, thus forming a record that shows the stage of the water for every hour of the time covered. The movement of the pencil is governed by worms driven by clockwork. The instrument may be adjusted for one, four, or seven-day periods.

WHAT IT COST TO BUILD SIXTEEN CANTONMENTS

Nearly $300 per soldier, or a total of $187,000,000, was the cost of the 16 army cantonments built last summer and fall to house 650,000 men. The original estimate of the cost was $134,000,000. This huge construction job was carried forward with a speed that is considered truly remarkable. By the end of last May, when congress was still debating the project, the engineering corps was fully organized for work. Within three months from that time cantonments capable of housing 300,000 men were completed, while by December 5 there were accommodations for the entire 650,000 men.

TWO PUSH BUTTONS ACTUATE SIMPLIFIED COMPENSATOR

For alternating-current motors an automatic compensator that eliminates the inconvenient features of the manual device and the complicated phases of self-operating magnetic contrivances, has been introduced. When the starting button is pressed the motor throws the mechanism into position and, after accelerating properly, causes a latch to trip. This turns the compensator to the running position and allows the motor to receive the full voltage. Provision is made for locking the stop button so that during repairs the motor cannot be started inadvertently.



COMMENT AND REVIEW

UP to a few months ago there was enormous waste in the use of freight cars. It was an impressive sight to watch a train of 50 or more cars sweep by, but perhaps not more than 10 of these cars were loaded to capacity. Where they were capable of loading 40 tons they held only 10 or 20 tons. Nearly all the costs of operating this train were the same whether it transported 800 or 2,500 tons. Now loading is required to the limit of the car. Where formerly one freight car was sent out each night from all large cities to each town along the line, with often only a few thousand pounds in a car, now the freight is held until a fair-sized load is accumulated. In some cases this means that Podunk receives only one, two, or three cars per week where formerly it had one every day, but shippers are finding they can adapt themselves to the scheme with little hardship, and the saving, taking the country as a whole, is tremendous. Now a country dealer, instead of waiting until his supply of some commodity is down to two days' supply before ordering, anticipates his wants and orders a week ahead.

Learning Systematic Saving

Retail dealers are cutting down delivery service, and instead of rushing a man, horse, and wagon to the far end of town with a yeast cake, or bunch of parsley, on a frantic "S. O. S." from Mrs. Jones, have established a schedule providing so many deliveries each day at certain hours. And Mrs. Jones is discovering she can just as well include the yeast cake when giving the usual daily order. When it is stated one of the largest firms in one of our large cities adds 10 per cent to everything it sells to cover the cost of delivery alone, some idea will be had of the saving possible, taking the country as a whole, even in the smaller towns.

THE Chinese government, the Pacific coast states, nor the labor unions will, neither of them, become enthused over any suggestion to bring Chinese workmen into this country, whatever the emergency. Should, however, the war continue for two or three years longer, just that thing may be necessary and desirable. At the time the Union and Central Pacific lines were creeping westward to form our first transcontinental railroad, that construction, so greatly needed, would not have been completed for years but for the thousands of Chinese. With hundreds of thousands of foreigners already gone across to join their various colors, and several million of our own men in the service here and abroad, and other millions engaged in the manufacture of army and naval supplies, the drain on our own man power will be felt. It might be advisable to bring in say 500,000 to work in our mines and on our farms, and thus maintain production of these two essentials at high efficiency, for only the duration of the war. As soon as our own men were mustered out and munition works closed, they could be returned; in fact that problem would solve itself, for very few Chinamen care to stay here permanently, and having amassed the few hundred dollars which makes them independent for life in their own land, they would have no incentive to remain here any longer than their contract required. They are both peaceable and hard workers, and would solve the question of two most vital industries, and without displacing any American labor whatever. By paying them the wages standard in mining and farming, there would be no occasion for dissatisfaction on that score. As conditions are likely to be, it is not a question of getting cheaper labor, but labor at any price. The question of transport might not be an easy one, but a way can be found even for that.

Chinese for Farms

Since the above was written the National Council of Defense is credited in the papers with the statement that on account of the shortage of help, it may be necessary the coming summer to utilize the labor of as many women as possible in farm work.

That the patriotism of the American woman will carry her into the fields to do as much of a man's work as she is physically able to accomplish, there can be no doubt whatever. There is likewise no doubt that she ought not to do so to the extent suggested, if any reasonable substitute means can be found.

WITH the closing down of practically all manufacturing plants for five days, and the first of the closed-to-business Mondays, the nation has had its first real taste of what it means to be at war. The draft, the assembling of the first troops, the war loans—all these were spread out over days or months and were absorbed gradually. Whether or not the emergency was as acute as reported is not known at this writing outside of Washington. However, even in peace times, the series of snowstorms which visited the snow belt east of the Rockies was sufficient to thoroughly disorganize railroad service. Certainly never in the history of railroads has there been anything like it. That passenger and emergency freight trains were so quickly restored to traffic over thousands of miles of tracks is one of the greatest tributes to the American railroad man in all the history of transportation.

Closed Factory Plants

While the general and long-continued cold weather made unusual demands upon the coal bin, there was no small compensation in the saving in gasoline. It is estimated that in the central West alone fully 1,500,000 automobiles and motor trucks were out of commission for 10 days, and at an average consumption of only one gallon per day per car, the total is 15,000,000 gallons of gasoline saved: and this estimate is doubtless much too low. Fifteen million gallons of "gas" will run a thousand aeroplanes five hours a day for almost a year.

Perhaps the by no means least satisfactory feature of the sudden shutdown, with its inevitable disarrangement in every line of industry and business, was the hearty and patriotic response with which the country accepted the mandate and lived up to its requirements both in spirit and in fact.

THE demand and consequent scarcity of almost everything has led to the recovery of much which was formerly thrown away. The junk man has been busier than ever before, though there are yet millions of pounds of metal lying about waiting to be picked up and melted into useful things. In the state of Maryland, steam dredges are now busily at work on a river, dredging out thousands of tons of pea coal which was deposited years ago. This river has its source in Pennsylvania, and flows through a section where hard coal is mined. Years ago there was no market for pea coal, which was disposed of by dumping into the river. The current, with occasional big drives during times of flood, carried this coal for miles and eventually deposited it like great sand bars. Having remained under water all these years, it has been preserved with only a slight loss of efficiency.

Recovering Former Waste

In almost every factory and small shop there are junk rooms full of forgotten but perfectly good material, much of which is of better quality than can be secured today, and was left over from special jobs. A good percentage of these supplies is workable, either in the plant itself or by some one outside. Now is a good time to clean house. Part surely can be used; a good portion of what remains can be sold for cash by a little inexpensive classified advertising, and what is unusable and unsalable will save coal.

THE engineering journals periodically remind their readers of the tremendous loss in fuel power between the coal pile and the operating machine. Belt, shafting, engines, and boilers all come in for their share, but greater than all combined is the loss in heat units which escape up the chimney, and emerge in clouds of dense smoke which carry for blocks and often miles. The electric motor, which stops when the machine it drives stops, has cut out most of the loss due to belt and shaft, but the loss due to unscientific firing is yet general.

Save Coal Where It Burns

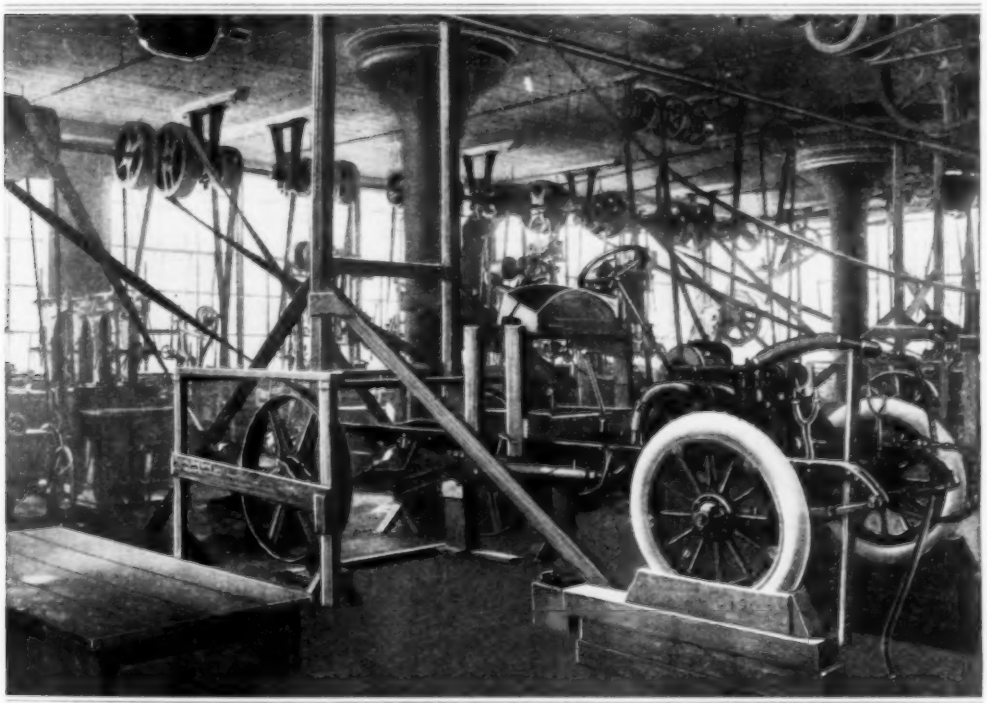
It is true that each boiler plant has certain characteristics peculiar to itself, and these likewise vary with weather, wind, and outdoor temperature. It is also true that the average stoker thinks he understands these conditions better than any outsider possibly can. This is often true, but in very many cases an experienced, practical man can show him tricks of firing of which he never heard or thought.

The foregoing is suggested by a letter from a reader, now retired, but for 35 years in charge of both small and large boiler plants. He suggests that himself and others with long-time valuable experience, and too old to resume severe labor, be invited to contribute their services in visiting such power plants as are not equipped with modern, scientific appliances, and teach the less efficient fireman how to get the utmost power out of every ton of coal. This would appear especially desirable in view of the change in many plants, some almost daily, from the accustomed grade of fuel long in use, to others of entirely different quality. It's a safe guess this very thing has been done in Germany for three years past.

January 19, 1918. H. H. WINDSOR

AUTO RUNS SHOP MACHINES DURING COAL SHORTAGE

Undismayed by the coal shortage which deprived it of electrical power, a motor-car company in Michigan proceeded to utilize one of its automobiles in operating its machine shop. The car was dismantled and the rear wheels were displaced by pulleys which were connected by belts with overhead shafting, after the car had been securely jacked up and the rear end set in a wooden frame. The makeshift was employed for several weeks and proved quite satisfactory.



Automobile Solves the Fuel Problem during the Coal Shortage. Dismantled Car is Employed to Run the Machinery in a Motor-Car Company's Shop

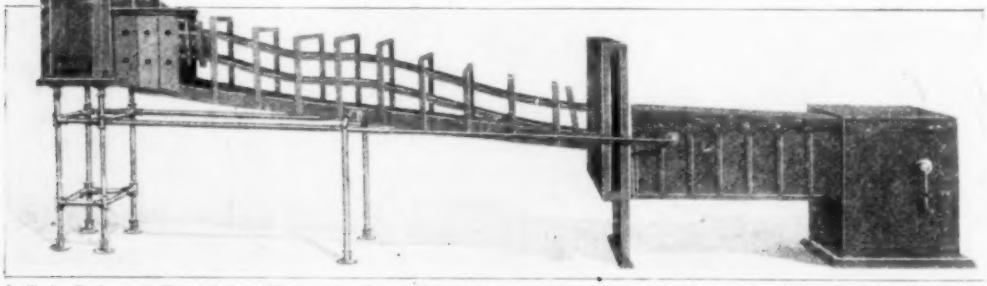
BUSINESS DESK DESIGNED FOR THE HOUSEWIFE

To meet the growing needs of the modern housewife who requires a filing place for bills and household papers of various sorts, as well as a broad-topped table or its equivalent, a desk designed especially for the home has been recently put on the market. Outwardly it resembles an office desk, but its spacious drawers are made like filing cabinets, adjustable compartments being provided for receipts, letters, clippings, canceled checks, calling lists, and the like.

A Businesslike Desk Equipped with Filing and Other Conveniences to Meet the Varied Needs of the Systematic Housewife

EXERCISING MACHINE HAS PATRIOTIC APPEAL

Zest is lent to the operation of a new coin-released exercising machine, having a patriotic appeal, because it accurately tests one's strength. After unlocking the mechanism by depositing a coin in a box at the lower end of an inclined track, the operator pulls a lever with all his might. This causes a cannon to be forced all or part of the way up the track. If the pull is sufficient the cannon will enter a fort at the top, striking a plunger and causing a flag to be agitated.



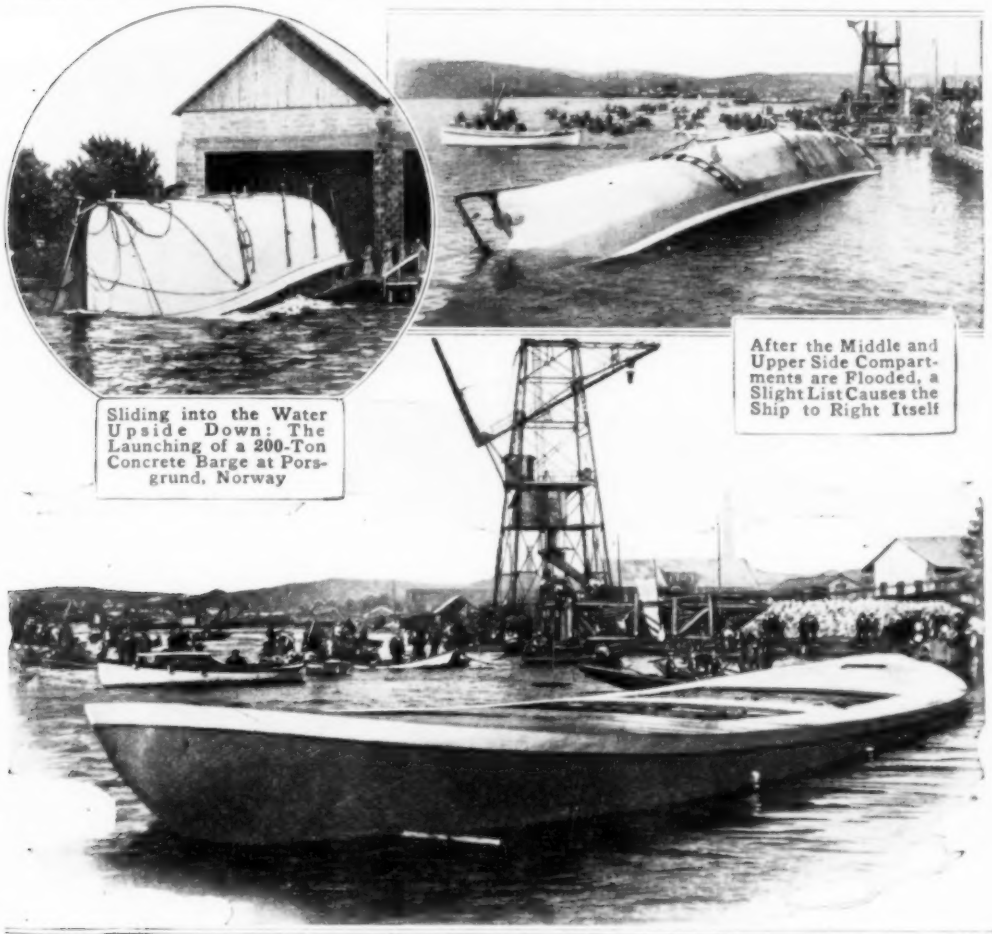
A Coin-Released Exercising Machine: After Depositing a Coin in the Box at the Right the Operator Pulls a Lever Which Forces a Mounted Cannon All or Part of the Way to the "Fort" at the Top of the Incline

CAMP-LIBRARY CAMPAIGN A BIG BENEFIT TO MEN

The campaign conducted last fall by the American Library Association for $1,000,000, with which to supply our soldiers with reading matter, resulted in raising more than $1,500,000. Over 500,000 volumes have already been sent to the training camps and to France and 220,000 more volumes are on the way. A complete library building costing $10,000 has been erected in every army cantonment but one, and buildings are also being erected in 16 national-guard camps and two special camps. For reasons of economy the books sent to France will be in charge of the Y. M. C. A., Red Cross, and similar organizations.

Of the 500,000 books already supplied to the soldiers one-fifth were purchased, while the remainder were gifts. It is believed that the public may be relied on for many more contributions. In fact the policy of the association is to look to donors for fiction and miscellaneous light reading and to spend the money raised for more serious books. To the great surprise of older army officers, the men have evinced a great desire for serious reading, the demand for books on military instruction being particularly great.

CONCRETE BOATS BUILT AND FLOATED BOTTOM UP



Sliding into the Water Upside Down: The Launching of a 200-Ton Concrete Barge at Porsgrund, Norway

After the Middle and Upper Side Compartments are Flooded, a Slight List Causes the Ship to Right Itself

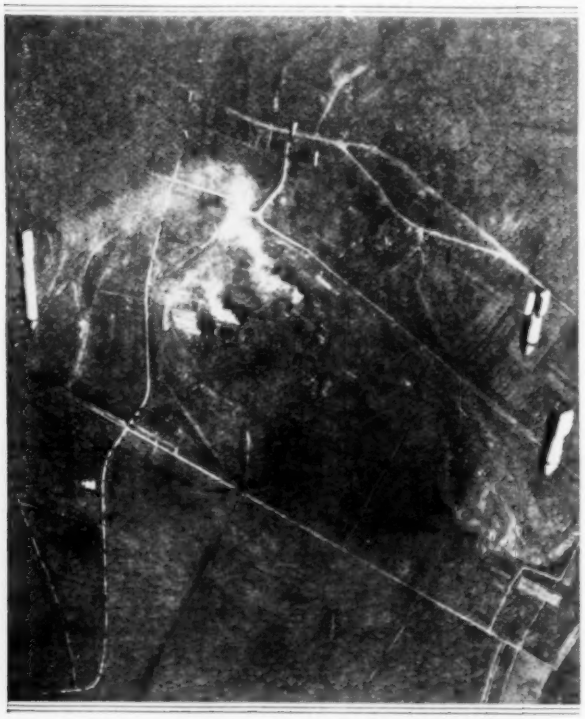
PHOTOS COPYRIGHT, KADEL & HERBERT

When the Boat Assumes Its Normal Position in the Water, as Shown Here, the Compartments are Pumped Dry and the Internal Mold Removed. In Practice the System has Proved Successful

In connection with reinforced-concrete shipbuilding it is interesting to observe that vessels of the type are frequently constructed and launched upside down. Such a system is employed commonly at Porsgrund, Norway, where many of the craft have been produced of late. By casting a boat in such a position the matter of controlling the density of the lower part of the hull is simplified. In subsequently launching the ship, advantage is taken of the compartments of the internal mold, which is left in place during the procedure. There are five spaces extending longitudinally; two on each side and one occupying the middle section of the hull. As the air escapes, the water rises through the central space and floods the upper side compartments, forming a column that in cross section is T-shaped. Since the lower side compartments remain dry, the ship gradually reaches a state of unstable equilibrium, for its center of gravity is higher than its center of buoyancy. Such a status prevailing, ever so slight a list to one side or the other will cause the craft to turn on its longitudinal axis and right itself. This usually takes place in 15 or 20 minutes with vessels of medium size. The compartments are then pumped dry and the inner mold removed.

REMARKABLE PICTURE SHOWS AERIAL BOMBARDMENT

One of the most interesting photographs that has been received from Europe's battle fields of late months is



Bombs Launched from a French Plane Falling on Burning German War Plant in Lorraine

reproduced herewith. It was taken during an attack on a German war plant in Lorraine by a French aeroplane and shows seven bombs shooting through space toward their target, which is already in flames. Largely because of perspective, and partly because of the angles at which the missiles are falling, it is difficult to realize that the projectiles are actually destined for the group of smoking buildings far below. The picture was taken by the camera installed in the plane that dropped the bombs.

¶Our readers will be interested to learn that the Y. M. C. A. building, called "The House That Jack Built," described on page 61 of the January issue, is located at Newport, R. I.

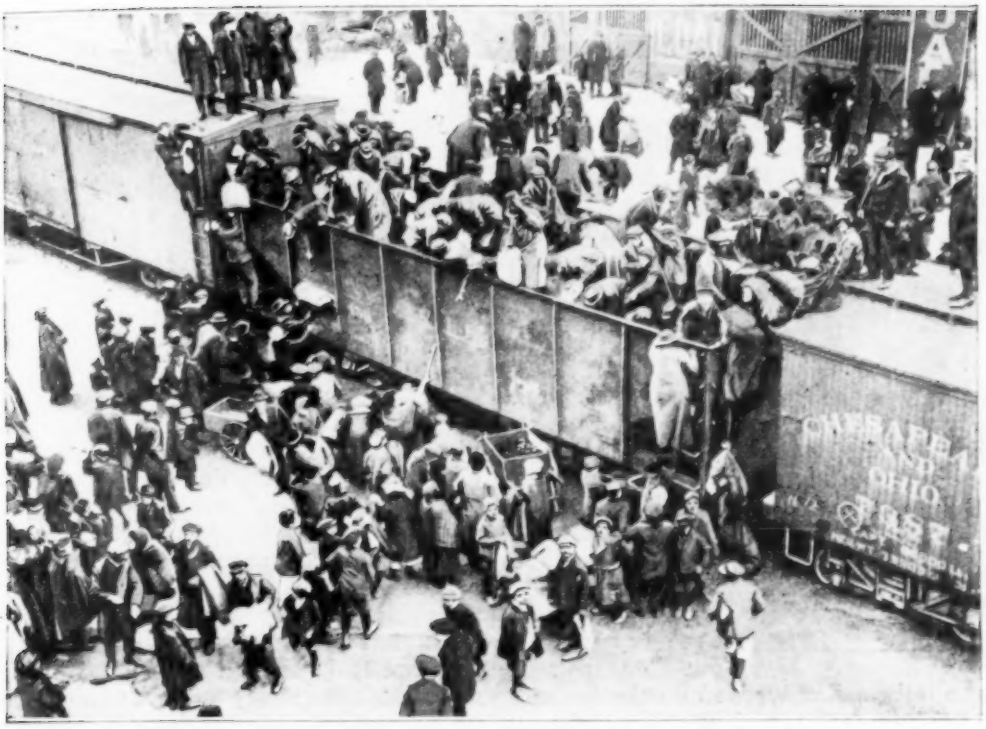
AMERICA HELPS FRANCE WITH FARM TRACTORS

The United States food administration has agreed to ship 1,500 farm tractors to France in time for this year's spring plowing. The first consignment of 100 machines left this country late in December, space having been secured aboard a naval transport. This move, it is believed, will lighten the burden of toil that rests on French women, children, and old men, and will release added tonnage for the allied and American troops by increasing the crop production in the sister republic.

How urgently this generous aid is needed is shown by the fact that the area sown to crops in uninvaded portions of France in 1917 was nearly 10,000,000 acres less than in 1913, or a decrease of 24 per cent. The total crop production in France for the past year is officially given as 24,500,000 tons, as compared with 29,400,000 tons in 1913. An American representative will accompany the tractors and organize a school of instruction for French operators, as well as assist the French in distributing the machines.

PLAN ALASKA-CAPE HORN WIRELESS SYSTEM

A new wireless-telegraph system is now being planned by the Marconi Company which will extend from Alaska to Cape Horn. This will bring various sections of the two continents into close communication with each other and with vessels plying in adjoining or intervening waters. It is hoped that enough stations may be established to permit communication between the United States and the Argentine Republic before the middle of the current year.

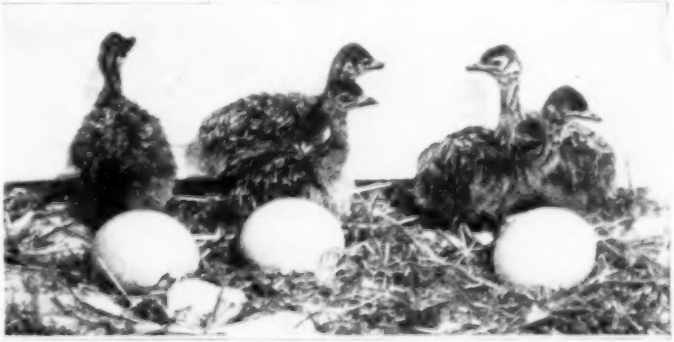


COLD AND FUEL SHORTAGE CAUSE COAL RAIDS

THIS photograph of scores of "coal-famished" men, women, and children raiding a loaded coal car in Philadelphia shows one of many outbreaks that occurred, particularly in the East, before the government laid down drastic fuel-conservation measures. Facing the alternative of freezing or breaking the law, hundreds of persons quickly chose the latter and struggled desperately to obtain at least a few pounds of fuel. Blizzards, long-continued low temperatures, and congested railways produced a fuel situation unequaled in the country's history.

OSTRICH EGGS HATCHED IN AN INCUBATOR

That an ordinary chicken-egg incubator can be used to hatch ostrich eggs was well demonstrated not long ago when five little ostriches broke through their shells in the poultry building of one of the state universities. The big eggs, which weighed more than 20 times as much as a hen's egg, were kept in the incubator 42 days. The motherless little creatures are being cared for in the most approved manner and, on attaining sufficient stature, will be transferred to a zoo. The success of this experiment suggests that the same method might be employed profitably in a commercial way.



Five Little Ostriches as They Appeared Soon After They had been Hatched in an Ordinary Incubator under the Supervision of Poultry Men at a State University

JAPAN HONORS SURVIVOR OF PERRY EXPEDITION

There is only one American now living who is able to compare from personal recollection the almost medieval Japan of 64 years ago with the Japan of today, transformed by its marvelous advance in industry, science, invention, and culture. That man is William H. Hardy, of Portland, Ore., now 82 years old, the sole surviving member of Commodore Perry's historic expedition that resulted in opening the island empire to the outside world. It was only a few weeks ago that he returned to Japan, and paid his respects to his old commander by visiting the Perry monument near Uraga. The old sailor's arrival was made the occasion of many remarkable demonstrations of friendship for the United States. The school children, high officials, and even the emperor himself, shared in bidding him welcome and in showing him the wonderful changes that have taken place in their land since his other visit in the middle of the last century.

PLANER HELPS SPEED UP OUR SHIPBUILDING

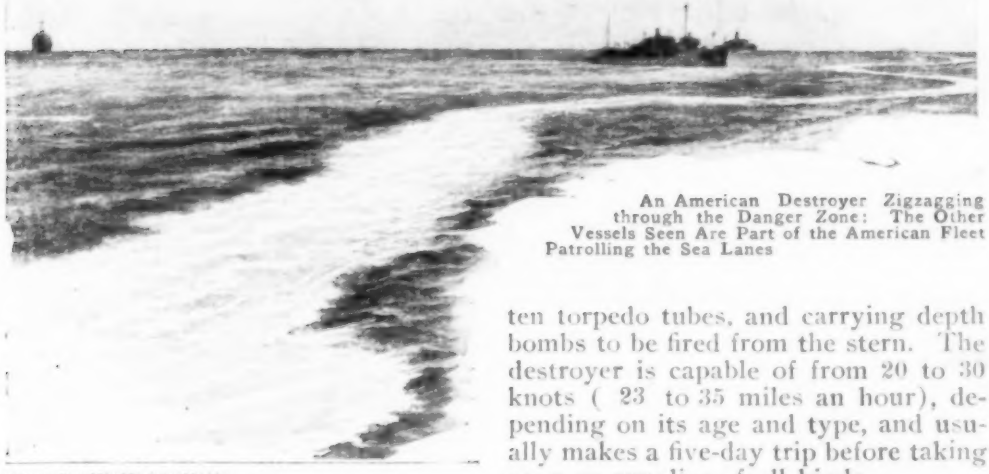
American ingenuity has produced a planer and shaper which is helping win the war by overcoming in a measure the very serious shortage of ship carpenters, needed to carry forward our wooden-ship program. The dressing of fir knees for braces in vessels was a time-consuming task when done by hand, but with the invention of this machine 11 knees can be finished in 15 minutes. Formerly that amount of work would occupy two men 20 hours.

COURTESY THE NATION'S BUSINESS

A New Planer and Shaper and a Knee for a Wooden Ship Which It has Partly Finished: This Machine Is Capable of Finishing 11 Knees in 15 Minutes

DEEP-SEA TAG

by E. T. Bronsdon



An American Destroyer Zigzagging through the Danger Zone: The Other Vessels Seen Are Part of the American Fleet Patrolling the Sea Lanes

COPYRIGHT UNDERWOOD & UNDERWOOD

A ROCKY MOUNTAIN ram, silhouetted against the sky on a crag a mile and one-half away, is a difficult target. A wild duck in full flight is also hard to bag. The snipe, likewise, has a way of stepping in between the "No. 8's" that you fire his way, but the "sportin'-est" game that flies, runs, or swims today is the German U-boat. No true sportsman, during this coming year, will think of wasting ammunition on prey of any less caliber. During past seasons it has been hard to draw lines between "potters," slaughterers, and true sportsmen. This year the task is easy. "Sport" demands something like an even chance for the intended victim—and the most enthusiastic jingo actually aboard a sub chaser nowadays does not deny that the pirate submarine possesses this chance. In fact sometimes—but that is ahead of the story.

The game is different from elephant or rhino hunting in that the individual need make no costly preparations. Uncle Sam attends to that. He provides his sportsmen with full equipment, guides, and all paraphernalia.

The apparatus generally used consists of a torpedo-boat destroyer, from 260 to 380 feet in length, mounting from five to twelve rifles, from six to ten torpedo tubes, and carrying depth bombs to be fired from the stern. The destroyer is capable of from 20 to 30 knots (23 to 35 miles an hour), depending on its age and type, and usually makes a five-day trip before taking on new supplies of all kinds.

The "Diesel-Fisch" on which the destroyer turns this ability and these weapons, is no mean antagonist, though. It is truly a triumph of engineering and mechanical ability, a steel leviathan of the sea depths which does not wait to be attacked. It is from 240 to 300 feet in length and is armed with four-inch guns and a large number of torpedo tubes in addition to innumerable bombs of the floating contact variety. It may be likened, in fact, to a combination of Battling Nelson (at his prime) and Freddie Welsh, for though it carries a substantial wallop in either fist it can dodge more punishment than any other craft afloat. It is capable of 20 knots (23 miles an hour) on the surface, and 14 knots (16 miles) submerged; it can submerge in nine minutes, and can stay under water for two hours or more if necessary.

One point concerning the construction of the German submarine merits attention in regard to an idea which has gained hold of the popular fancy in many quarters. The idea is, in short, that when a spot of oil appears near the spot where a shell has struck, that the submarine surely has been sunk. This is by no means necessarily the case. The hunters have no means of telling that they have "got" a sub

unless the latter gets entangled in a net or is forced to emerge from below the surface.

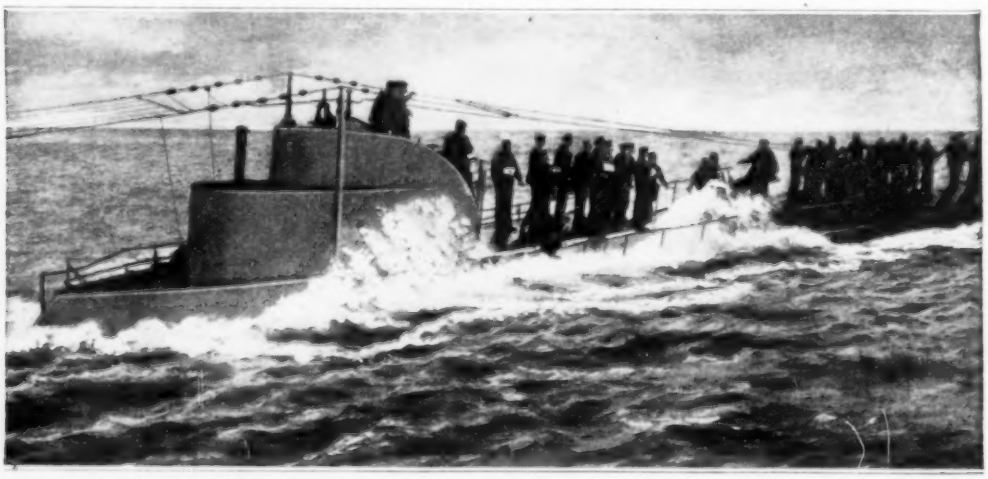
The reason for this, as stated, lies in the submarine's construction. When the craft is lying half submerged, the periscope shows above the water. Below this is the conning tower and hatchway, which may be sealed below by a valve in case of accident. Below this, and extending the length of the U-boat, is a platform on which the crew disport themselves while watching the death agonies of torpedoed steamers. Under this—and this is the last part that projects from the water under normal conditions—are the oil tanks, running the length of the middle half of the submarine. The next layer down is the layer of defensive armor. It can be seen readily, therefore, that while spilling a submarine's supply of oil is comparatively easy—all that is necessary is a skimming hit—breaking into its vitals themselves is not so easy. In fact, there is only a space of about one foot in which a three-inch shell may strike in order to damage the submarine irreparably. Truly it is a sportsman's game!

The destroyers have two big advantages to offset the disadvantages under which they labor. One is the type of gun they carry. This is far ahead of the bigger guns toted by Fritz, because it fires so much faster. Throwing a shell into the breech closes the breech, because a ferrule on the shell catches a clip on the lock and swings it into position. The trigger is pulled for one shot, and the recoil shoots out the empty shell case. All is ready for a reload, and the whole time consumed (under ideal conditions) is not more than one and three-quarters seconds.

The other advantage possessed by the destroyer is a superior ability to dodge. If they did not have this, the submarine must come out of this campaign a victor.

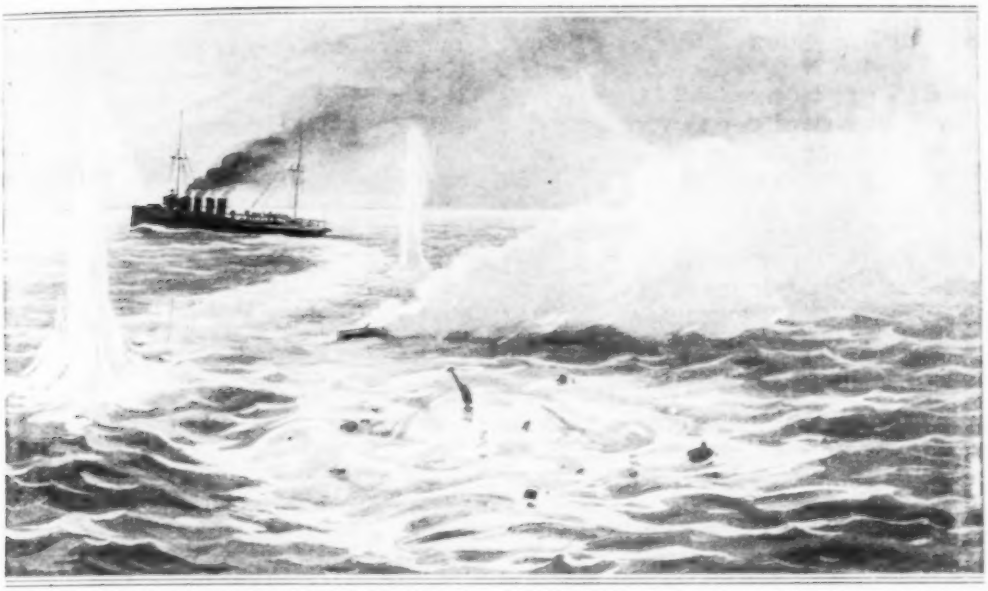
A third advantage which is not possessed always, is light draft. At the close of a trip the destroyer is apt to draw only six or seven feet of water, which decreases the danger from unseen torpedoes in great measure, for the torpedo operates best at a depth of ten feet, and usually is fired to arrive at that depth.

It is not permitted to discuss the methods of patrol or convoy of transports or merchant ships. Suffice it to say that, over the whole danger zone, now enough vessels are plying to prevent the German submarines from raiding commerce single-handed. They operate in groups now, and while



COPYRIGHT, COMMITTEE ON PUBLIC INFORMATION

Losers in the Game of Deep-Sea Tag: The Crew of This German Submarine are Seen in the Act of Surrendering to the American Destroyer "Fanning". They Received Every Practicable Kindness and Courtesy at the Hands of Their Captors



A Destroyer Fighting Submarines with Depth Bombs: It Proceeds as Rapidly as Possible to Escape the Effects of Its Own Ammunition. The Geysers Indicate Exploding Bombs, While the Widening Pool of Oil in the Foreground is the Life Blood of a Submarine. The Smoke Screening the Destroyer Arises from a "Smoke Box" Which It has Thrown Overboard

this is more hazardous to shipping it is likewise more dangerous to the submarines, for if a group is surprised by destroyers before it has a chance to submerge, the whole number is likely to be accounted for.

Submerged submarines are fought with depth bombs, released by a trigger from the stern of the destroyer. They are set to explode several seconds after they are released. Even if the spring and fuse by which they are exploded should fail to work, the pressure of the water at certain depths would explode them anyway. They are dropped while the destroyer is making full speed ahead. Never does a vessel stop and then slip a few depth bombs over the side, for the ensuing explosion rocks the ocean to its bottom, and sends up a geyser higher than Old Faithful and one-tenth as large in diameter as the crater of Vesuvius. If a vessel lingered—well, there wouldn't be any vessel left to tell the tale.

The only trouble with using these is that the destroyer's crew rarely can do more than surmise as to the submarine's fate. This does not sound like much of an obstacle, set in between all the real horrors of such warfare, but it is. Just as it weighs upon a base-hospital surgeon never to know how the patients upon whom he operates get along, driving him near to insanity finally, the continual firing of depth bombs with nothing tangible to show for it, weighs on the nerves of the crew.

But how is the campaign against the submarine actually progressing? This is hard to state positively. From all that it is possible to learn, up to Dec. 10, 1917, the American destroyers had reported approximately 30 submarines as "certainly destroyed." This number, of course, is conservative, and takes no cognizance of the scores which probably have been blown to bits by depth bombs, and those which actually sank when "spots of oil appeared." Nor does this figure include the work done by the combined British, French, and Italian fleets in the campaign, and this total, of course, is considerably greater than that of the American destroyers, first because of a greater number of vessels operating, and second because they have been after the U-boat so much longer.

The campaign really is a monstrous and deadly serious game of tag, and most of the time there is considerable doubt as to who is "it." One American destroyer of our newest type just recently went to the assistance of a sinking transport, and in doing so shelled one submarine effectually with its forecastle gun as it approached. The submarine was hit badly, for it could not submerge. The American destroyer turned to succor the crew of the transport (it had no troops aboard), but just as it did so, two torpedoes from lurking U-boats behind struck it, damaging it so it sank in three minutes.

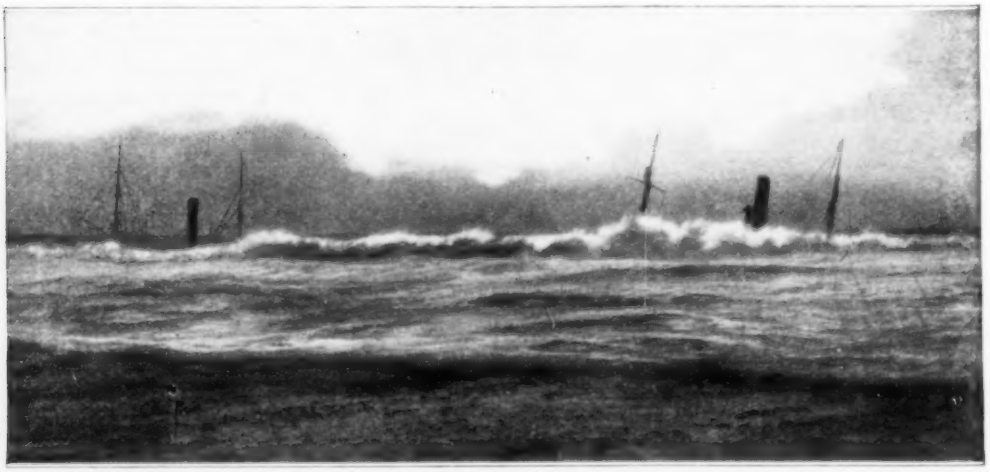
This sort of trap has been very popular with submarine commanders recently, and at first it was quite successful. On one occasion the commander of a sinking craft, seeing six U-boats waiting grimly beside him, refused to signal for assistance from a destroyer. A U-boat thereupon came alongside, an officer boarded the vessel and sent up signal rockets himself. Happily upon this occasion three destroyers were near, so the only consequence was the sinking of one of the submarines.

All signals between vessels and destroyers, and between the destroyers themselves, except those sent by flags when near at hand and by rockets when in dire distress, are by special radio code. This is at once a protection and a trap, for if the enemy gets this code the destroyers usually will suffer.

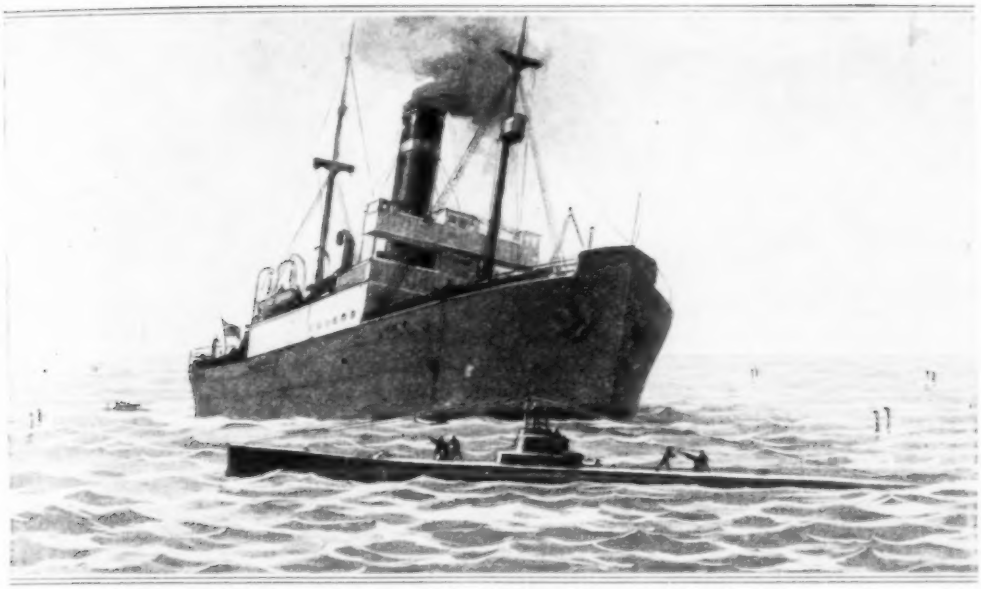
One of our veteran destroyers, recently ran into such a trap. Through some means or other the U-boats that day had copies of the radio code. An "S. O. S." message came whirling out, seemingly from a sinking munition carrier, unconvoyed, and making for King George's Channel and Liverpool. The destroyer, being near at hand, immediately answered the message, and steamed straight into the trap. The code message kept giving directions, and the destroyer kept giving assurance, telling how fast it was coming and on what course.

Forty miles off Queenstown, the destroyer ran clean into the waiting arms of three U-boats. "Hard left!" came the cry from the bridge, and every man knew that it was nip and tuck between the turning of the helm and a torpedo.

"That's wrong," came a low, fascinated cry from one of the gunners. "We're steering right into it!" He pointed down at the sea where, obliquely, a dark shape like a porpoise —only speedier and more straight— was hastening toward the destroyer. It was too late to do anything. Two



German Mine Sweepers Sinking Off the Coast of Jutland: Four of These Vessels were Captured by British Destroyers. They were So Badly Damaged That It Was Necessary to Run Them into the Harbor and Beach Them. The Crew Leaped into the Water and Swam Ashore. Later They were Interned



A Tragic Moment in "Deep-Sea Tag": The Crew of the Torpedoed Ship Chose to Sink Rather than Send the Distress Signal Which would Bring an American Destroyer into Conflict with Six Grimly Waiting Hun Submarines. A U-Boat Commander Climbed Aboard and Sent the Signal Himself

torpedoes had been avoided by the turn of the helm. The third, coming from a different quarter, was too near.

All hands on deck held their breath and thought of their loved ones, for it seemed that death was but a second distant. The second passed and yet another. . . . .

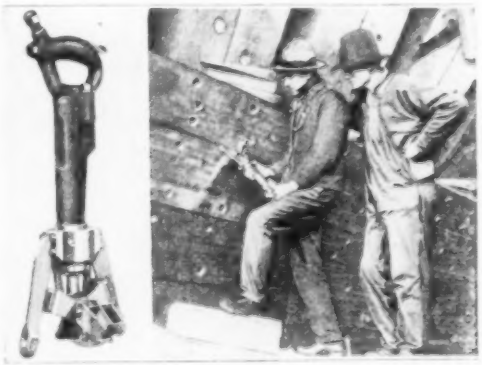
"It went under us!" came a relieved yell from the lookout on the mast, and the tension relaxed.

That instant many things happened, however. Three submarines opened fire at once with their guns, the bridge crumpled, the single mast was shot away clean, and the gunners on board the destroyer opened fire also.

On went the destroyer at full speed, weaving an irregular course to avoid the torpedoes. One of the submarines was winged, though not badly, and then all three submerged. The destroyer dropped depth bombs and proceeded to port.

SHIPBUILDING SPEEDED UP BY CALKING MACHINE

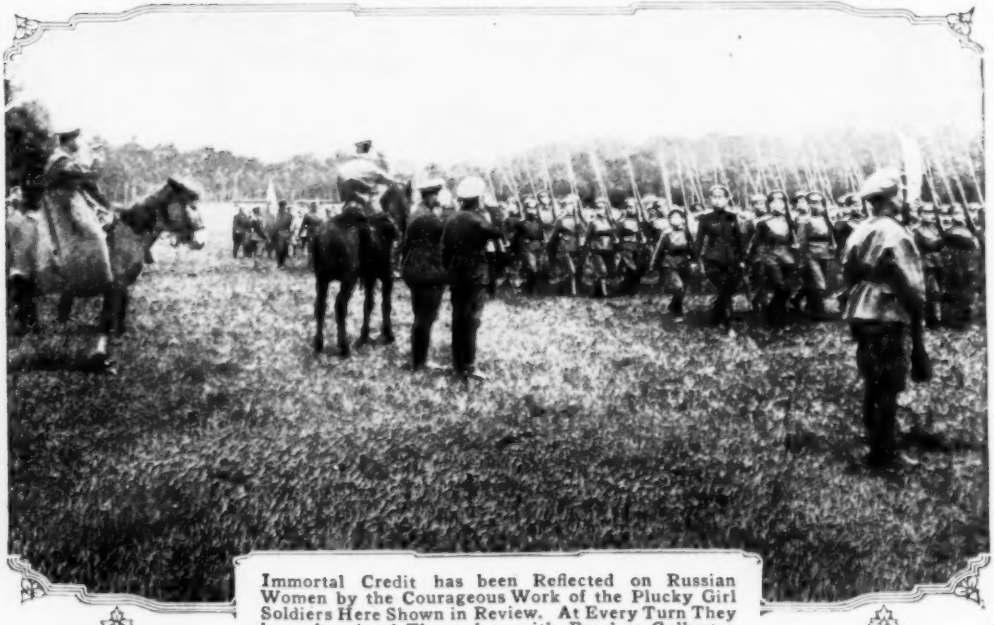
One of the important inventions which has been brought out by the present revival in shipbuilding is a pneumatic calking machine that eliminates hand work in filling the cracks and seams of a wooden vessel's hull and decks with tarred oakum. The new machine is provided with a metal finger that feeds the packing into the crack at the proper speed, while a hammer, driven by compressed air, pounds it in much faster than could be done by the old method.



A Pneumatic Tool That Eliminates the Slow Process of Calking a Vessel's Seams by Hand. Right: Filling a Wooden Ship's Seams with Tarred Oakum with the Aid of the New Tool

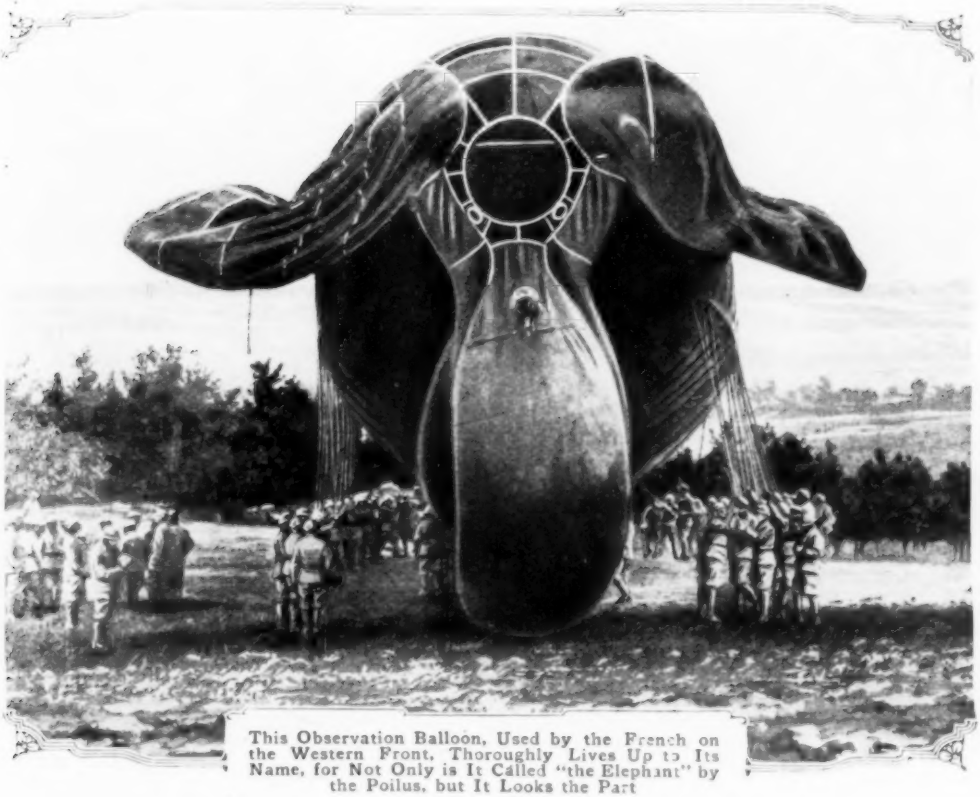
RUSSIAN "BATTALION OF DEATH" IN FIELD

Picturesque Glimpse of Part of the "Battalion of Death" Encamped in a Clearing near the Front: The Conduct of the Girls and Women Composing This Remarkable Body of Troops has Surprised the World

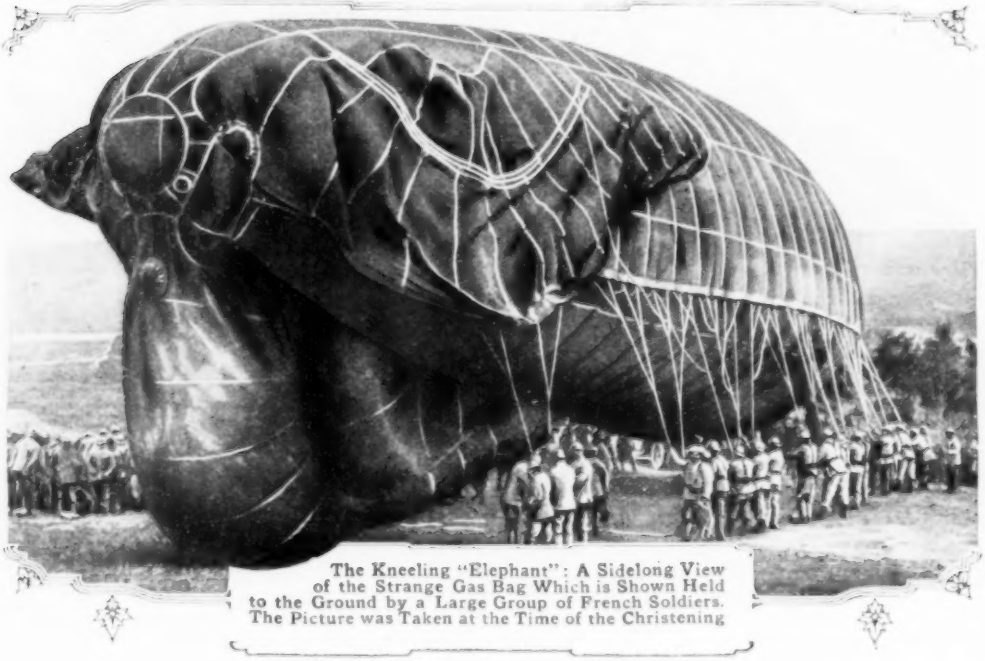


Immortal Credit has been Reflected on Russian Women by the Courageous Work of the Plucky Girl Soldiers Here Shown in Review. At Every Turn They have Acquitted Themselves with Pearless Gallantry

AERIAL ELEPHANT STARTLING FRENCH CREATION



This Observation Balloon, Used by the French on the Western Front, Thoroughly Lives Up to Its Name, for Not Only is It Called "the Elephant" by the Poilus, but It Looks the Part



The Kneeling "Elephant": A Sidelong View of the Strange Gas Bag Which is Shown Held to the Ground by a Large Group of French Soldiers. The Picture was Taken at the Time of the Christening

AIRMEN DROP FOOD FROM SKY TO TROOPS

FROM THE SPHERE, LONDON. COPYRIGHTED IN THE

ITALIAN fliers "bombing" their marooned comrades with bread: One of the striking incidents The defenders of the position, a band of Alpini that with desperate courage upheld its determined to make a stand so long as their ammunition lasted. While gallantly answering situation was met, however, by their airmen, who dropped bags of bread to them.

ON MOUNTAIN TOP SURROUNDED BY ENEMY

UNITED STATES BY THE NEW YORK HERALD CO

attending the great retreat of King Victor Immanuel's forces before the Germanic onslaught. traditions, were cut off from supplies and unable to retreat. Rather than surrender, they the Austro-German fire their scanty rations became exhausted and they faced starvation. The

AMERICAN OFFICERS TRAINING IN FRANCE

COPYRIGHT, UNDERWOOD & UNDERWOOD

Some of Our Student Officers and Their British Instructors at a British Camp in France Where the Commissioned Men Receive Their Final Course of Training

COPYRIGHT, UNDERWOOD & UNDERWOOD

General View of the Training Camp Attended by Those Shown in the Picture Above: After Finishing Here the Officers Are Ready for a Turn in the Trenches with Their Men

COPYRIGHT, COMMITTEE ON PUBLIC INFORMATION

Beginning the Erection of an American Army Cantonment in France: The Buildings Are of Unit Construction and Shipped Knocked Down from the United States

AND UNHAPPY SAMMIES IN FRITZ'S HANDS

COPYRIGHT, UNDERWOOD & UNDERWOOD

The First American Soldiers Captured by the Germans are to be Seen among the Men in the Motor Truck at the Left, Which Is Probably on Its Way to a Prison Camp

COPYRIGHT, UNDERWOOD & UNDERWOOD

German Officers Questioning Five of Pershing's Men Captured in "No Man's Land": The Occasion Seems to Be a Pleasant One for the Officer at the Extreme Left

COPYRIGHT, COMMITTEE ON PUBLIC INFORMATION

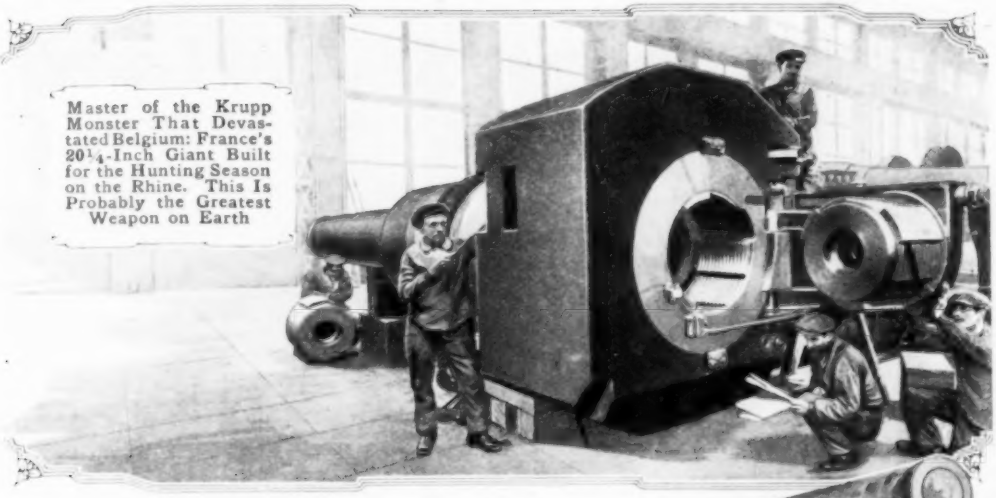
Student Airmen Learning Telegraphy at a Ground School: The Tape in Front of Each Man Records His Work so That It may be Checked

COPYRIGHT, UNDERWOOD & UNDERWOOD

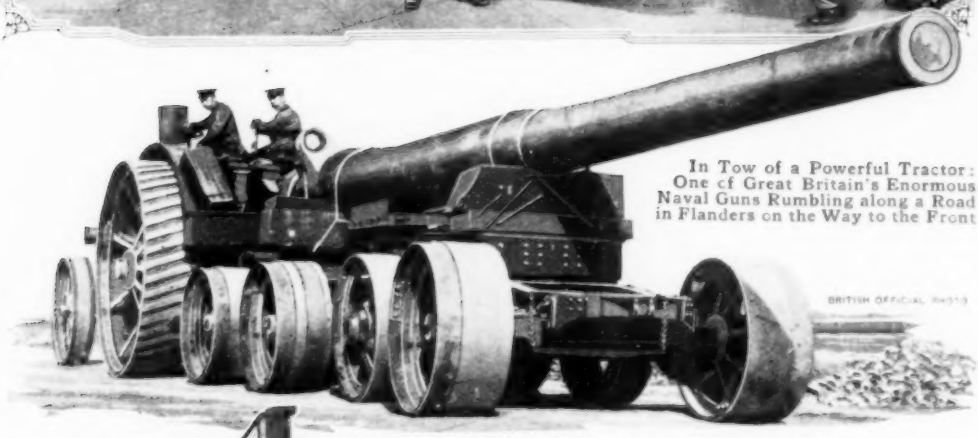
TANK RETURNS FROM ENGAGEMENT WITH GERMAN GUN IN TOW

BRITISH tank, at the end of a day's work in the vicinity of Cambrai during the great offensive that smashed Hindenburg's line, returning with a trophy of the fight: The occasion was one of vindication and triumph for the land monitors, for to them falls the credit for breaking the way for the troops without the usual artillery preliminaries. The tanks, which the Germans had ridiculed in their characteristic manner, made General Byng's surprise attack possible and delivered the Boche a staggering blow.

BIG GUNS USED BY ALLIES ON LAND AND SEA

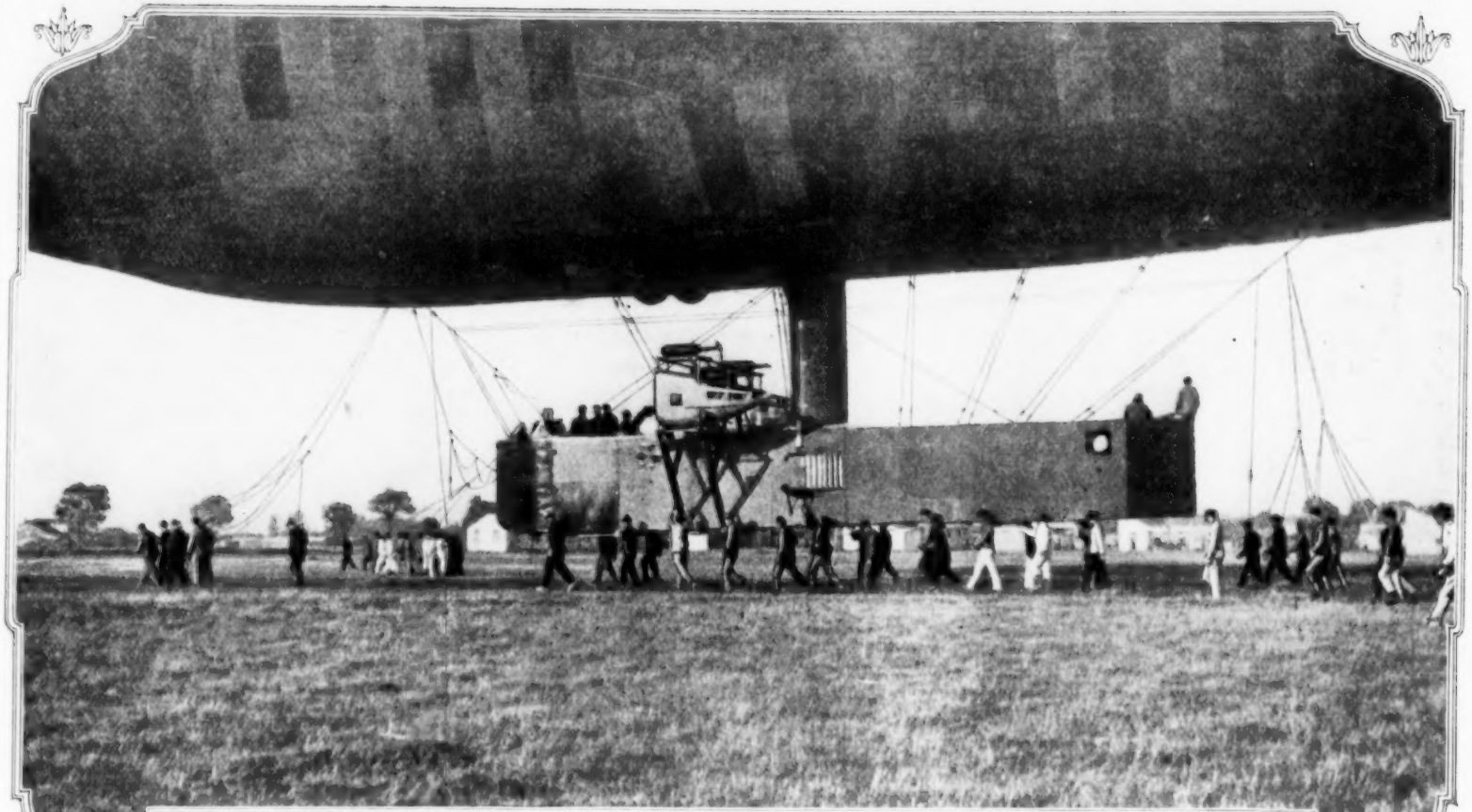


Master of the Krupp Monster That Devastated Belgium: France's $20\frac{1}{4}$-Inch Giant Built for the Hunting Season on the Rhine. This Is Probably the Greatest Weapon on Earth



In Tow of a Powerful Tractor: One of Great Britain's Enormous Naval Guns Rumbling along a Road in Flanders on the Way to the Front

Fighting a Soaring Seaplane in the Adriatic: A British Monitor in Action, with the Antiaircraft Battery Walled Off with Sandbags for Protective Reasons

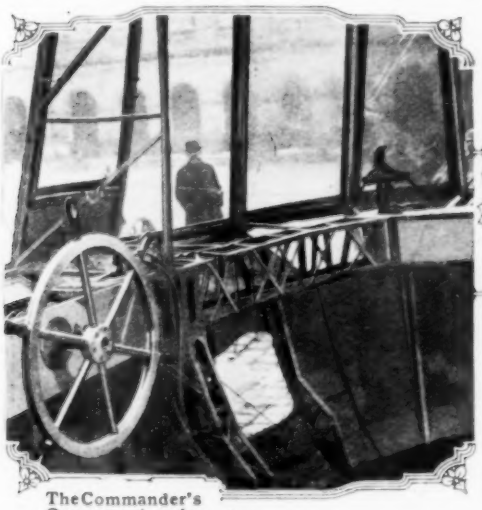


COPYRIGHT INTERNATIONAL FILM SERVICE INC.

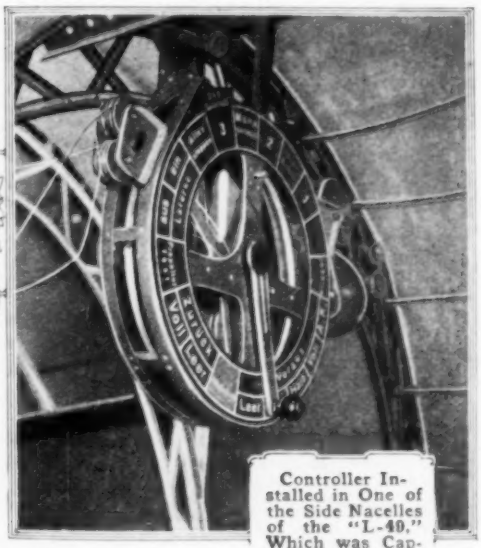
AERIAL SEA SCOUT TERROR OF GERMANY'S SUBMARINES

ONE of the big flexible dirigibles used by the French in hunting and destroying German U-boats is seen in the illustration. This craft is better adapted for the purpose than the seaplane, for in addition to its ability to drop bombs with more accuracy than the heavier-than-air machine, it makes repairs in flight with ease. Over land it is exposed to great dangers, but at sea it is safe, for a submarine has poor success in firing at an aerial target.

PHOTOS SHOW DETAILS OF CAPTURED ZEPPELIN

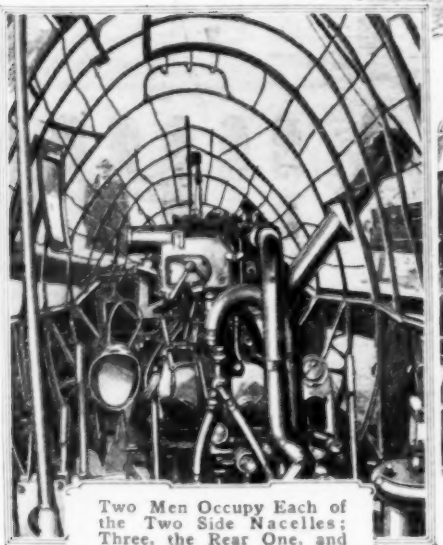


The Commander's Quarters in the Big Craft, Which has been Dismantled and Placed on Display at the Hotel des Invalides in Paris



Controller Installed in One of the Side Nacelles of the "L-40," Which was Captured by the French at Bourbonne-les-Bains

The Rearmost of the Four Egg-Shaped Nacelles Mounts Two of the 240-Horsepower Engines. The Bow of the Forward One is Occupied by the Commander



Two Men Occupy Each of the Two Side Nacelles; Three, the Rear One, and Four, the Forward Housing

Close-Up View Showing One of the Five Big Motors Which Combined Give the Zeppelin 1,200 Horsepower

PHOTOS FROM FRENCH PICTORIAL SERVICE

SOME CASUAL GLANCES BEHIND THE SCENES

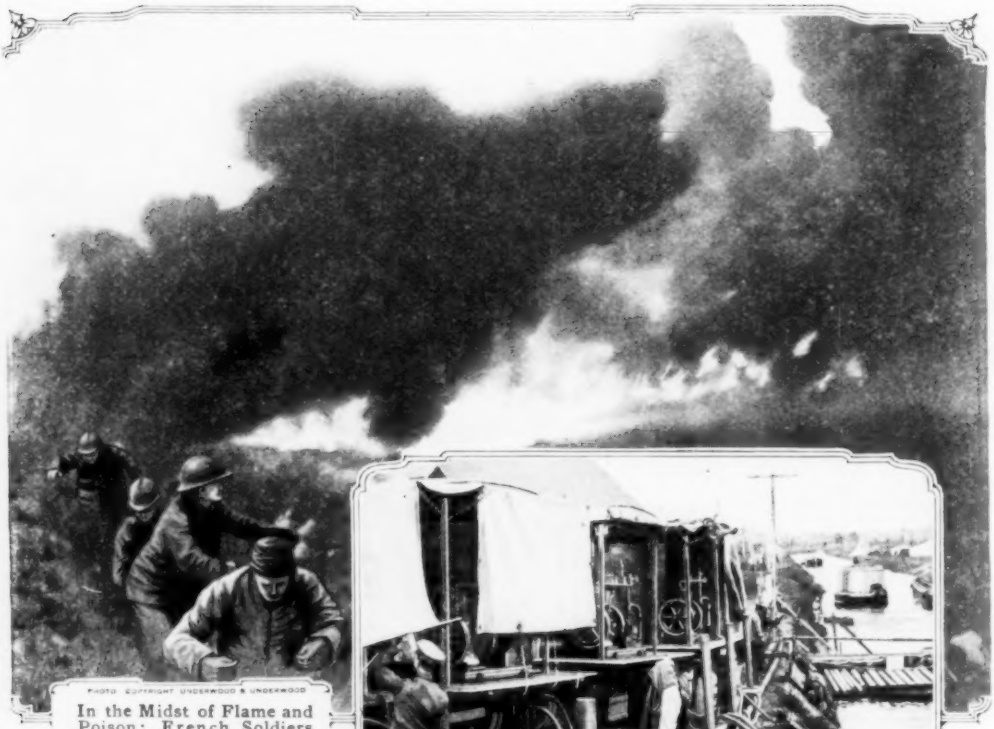
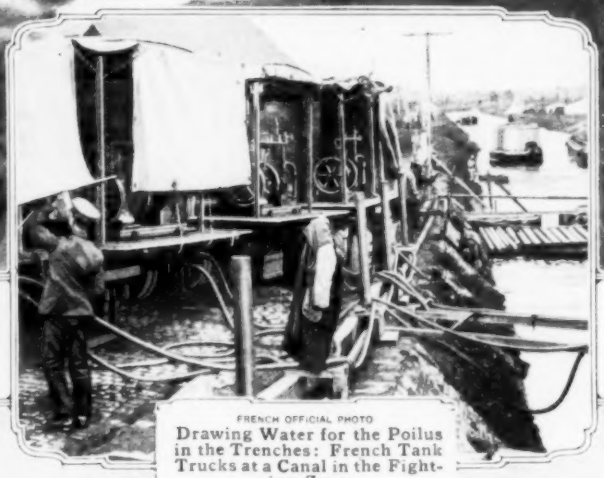


PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

In the Midst of Flame and Poison: French Soldiers Routed by a Gas Bomb, Dropped from an Aeroplane, While Playing Streams of Liquid Fire on the Boche's Trenches



FRENCH OFFICIAL PHOTO

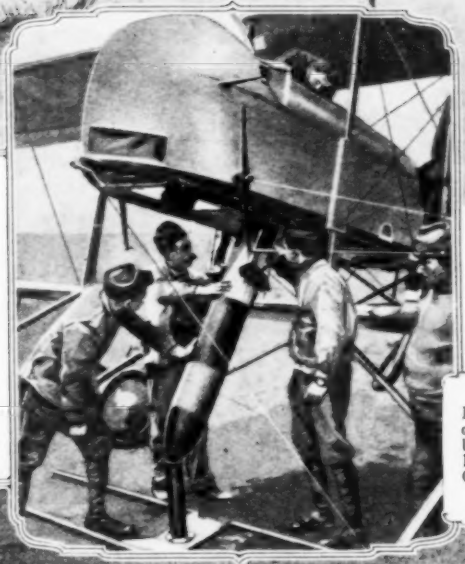
Drawing Water for the Poilus in the Trenches: French Tank Trucks at a Canal in the Fighting Zone

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

As Advances are Made Roads are Carried Forward and Trenches Bridged. Here Cavalrymen are Crossing a Trench on the Way to the Front during the Fighting near Cambrai

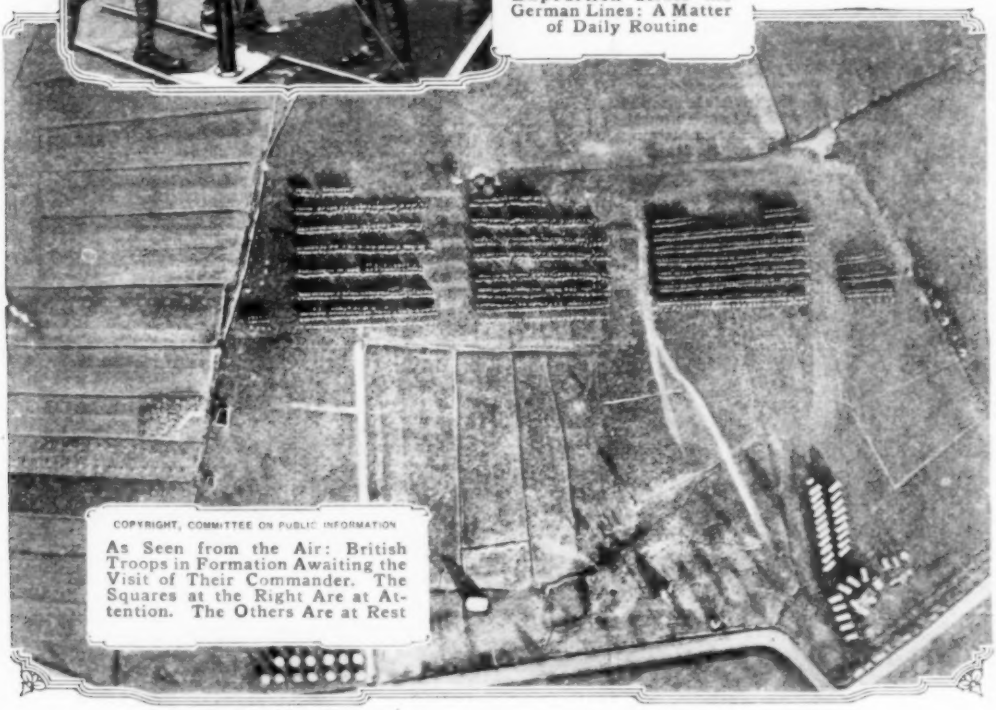
PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

Tommy Atkins Takes His Morning Plunge: The Picture Shows One Group of Soldiers in the Water, Another Disrobing and Awaiting Its Turn, and a Third Returning to Camp



FRENCH OFFICIAL PHOTO

Filling the Bomb Tubes of a French Battleplane before Starting on an Expedition across the German Lines: A Matter of Daily Routine

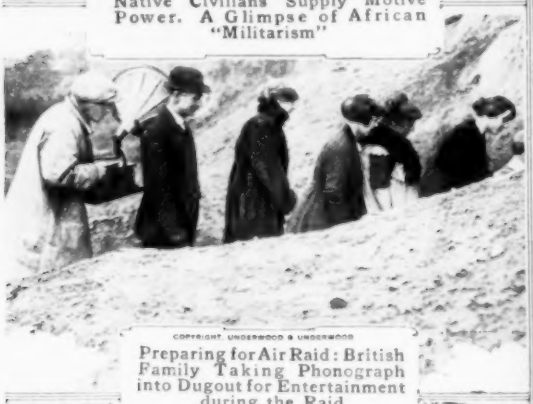


COPYRIGHT, COMMITTEE ON PUBLIC INFORMATION

As Seen from the Air: British Troops in Formation Awaiting the Visit of Their Commander. The Squares at the Right Are at Attention. The Others Are at Rest

WAR BROUGHT HOME TO COUNTRIES FAR

Movement of Troop "Train" in the Congo: The Soldiers Ride While Native Civilians Supply Motive Power. A Glimpse of African "Militarism"

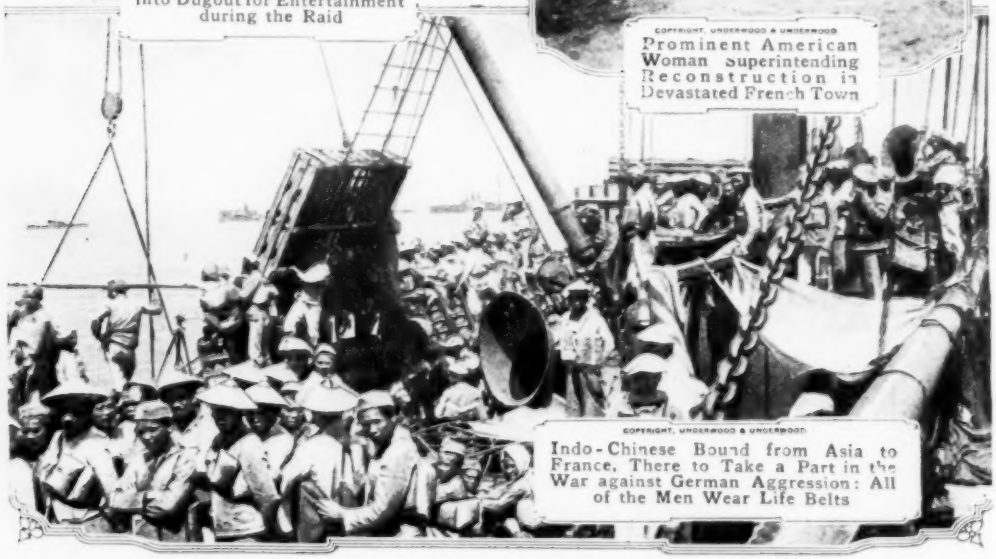


COPYRIGHT, UNDERWOOD & UNDERWOOD

Preparing for Air Raid: British Family Taking Phonograph into Dugout for Entertainment during the Raid

COPYRIGHT, UNDERWOOD & UNDERWOOD

Prominent American Woman Superintending Reconstruction in Devastated French Town



COPYRIGHT, UNDERWOOD & UNDERWOOD

Indo-Chinese Bound from Asia to France, There to Take a Part in the War against German Aggression: All of the Men Wear Life Belts

APART AND PEOPLES WIDELY DIFFERENT

COPYRIGHT COMMITTEE ON PUBLIC INFORMATION

Belgians, Escorted by Soldiers, Quitting Their Homes at the Outset of a Bombardment by the Germans

Drilling Serbian Child Refugees at Vodena, in Macedonia, to Hide in Great Hollows of Trees When Flying Huns Approach: Red Cross Flags Mark the Retreats

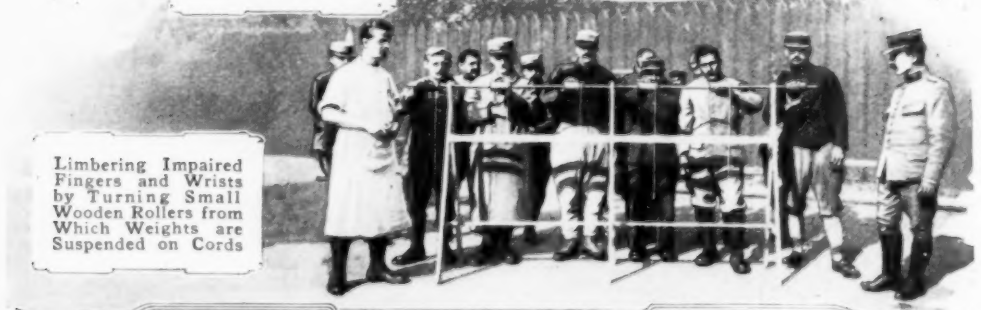
COPYRIGHT, UNDERWOOD & UNDERWOOD

Hurrying Babies and Tiny Children into Bomb-Proof London Dugout to Protect Them during an Attack of Zeppelins on the Metropolis

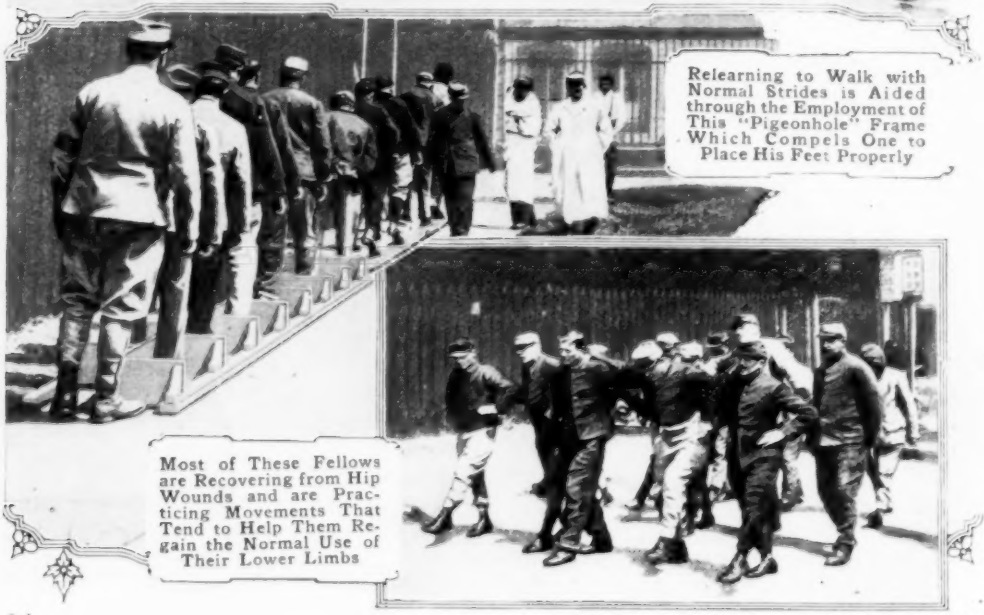
EXERCISES MAKE POILUS' STIFF JOINTS SUPPLE

Treating Injured Knees by Gradually Flexing the Joints: The Men Move Along Slowly, Keeping One Foot on the Inclined Board Which Rises to a Height of Two Feet

Convalescent French Soldiers Using Ladderlike Devices That Assist Them in Overcoming Stiffness in the Shoulders



Limbering Impaired Fingers and Wrists by Turning Small Wooden Rollers from Which Weights are Suspended on Cords



Relearning to Walk with Normal Strides is Aided through the Employment of This "Pigeonhole" Frame Which Compels One to Place His Feet Properly

Most of These Fellows are Recovering from Hip Wounds and are Practicing Movements That Tend to Help Them Regain the Normal Use of Their Lower Limbs

COPYRIGHT, KADEL & HERBERT

BUSINESS OPPORTUNITIES OF RUSSIAN FAIRS

Five Thousand Russian Shops in a Small City Sell $50,000,000 Worth of Goods in Six Weeks

By F. H. WILLIAMS

International Trade-Mark Specialist

FAIRS in Russia are the greatest means of exchange and distribution, and the sales at the annual fair of Nizhni Novgorod amount to more than $50,000,000 every year. In the 11 days from August 7th to 18th it nets the majority of this amount, as these are the great purchasing days. This fair lasts but six weeks, from the last week in July until the first week in September. How many American manufacturers hear about it?

Nizhni Novgorod is a spot where any American manufacturer can learn more about Russia, Russians, and Asiatic commerce in a week, and learn more about how credits are extended in foreign markets, than anywhere else in the world. It is a spot where the growth of the international spirit of commerce is so evident that it can be studied by any business man for ideas of its most extended development for his own interest. No less than 75,000 purchasers from all parts of Asia alone attend it, and often double this number from various parts of Russia. At times more than 400,000 people are gathered together within the fair's limits. There is nothing in the world to compare with it. Picture some 60 blocks of two-story buildings — some two and one-half stories—with about 2,500, or more, shops, and then other blocks of buildings forming some 2,000 more shops. About 5,000 in number, their average sales are over $10,000 each. Each shop has its staff of clerks, principals, etc. The goods of each trade is called a "row." For example, one will find "Fur Trade Row," "Striped Linen Row," "Soft Goods Row," "Soap Row," "Cosmetic Row," "Glass Row," etc. The smaller buyers negotiate with the salesmen whose services are requisitioned in order to obtain a large quantity of goods for the sum demanded, more extended credit, or a reduction in price, all of which details the principals leave to their salesman. A credit manager is unknown. More important traders are handled by the principals, whose treatment of them is almost royal. Many are taken upstairs to the private apartments of the principals. If one has been so fortunate as to view some of these residences he has seen furnishings that are not to be equaled in the business world.

September seventh is the important day when all bills given during the course of the fair fall due. Often a customer takes away thousands of dollars worth of goods and only signs a "chit" for them. Yet very little is lost through this system, and results, as far as collections are concerned, are most favorable. The Russian likes to pay his bills.

As an advertisement for one seeking the Russian and Asiatic markets, the fair has no equal. If one can arrange to secure space at any of the annual fairs, he can always hire interpreters who will act as salesmen, and need not know any language but his own. The principals-owners of the various exhibits seldom speak the language of the purchaser.

Here one can learn more of the requirements of the markets of the great Far East and the requirements for turning public taste toward American articles than he will ever secure from books. He will also learn some things about export packing that writers for some reason have neglected. Take, for example, a kerosene stove, the top of which is made of cast iron, the center of enamel ware, and the oil tank of brass. The American method is to pack the whole in one case, and to follow printed instructions about careful packing, strapping, and the like. The correct packing for export requires more than this. Consideration is given customs tariffs, and the parts are packed separately so that each may secure the cheapest tariff rate.

At the Nizhni Novgorod fair catalogs

COPYRIGHT BY F. H. WINDSOR

will serve one in good stead if personal representation is not feasible. It is a good thing to keep in mind the names of the cities in Russia where other large fairs are held and forward at the seasons mentioned some 100 or more export catalogs. It is easy to make a foreign catalog an asset that will produce orders, and it is not necessary to translate the whole catalog into the several languages. Terms, credit, system of ordering, one's foreign policy, and what one's correspondence and service department will do should be carefully and briefly explained in the Russian, Chinese, German, Danish, French, or such other languages as seem advisable. The catalog story should be told in pictures, as these speak all languages. The foreign merchant no longer demands the whole catalog in his language, but if interested will take it to some one who will interpret its pages for him.

Originality counts as much in foreign catalogs as it does in foreign advertisements, and both can be classed together. The manufacturer must not be satisfied with simply putting together an old catalog with its stagnant leakage of other catalogs, perhaps thinking it will do. Every page should count. Some manufacturers are born economists when it comes to spending a dollar in good printing matter; they should never enter the foreign field where good catalogs count so much. Remember the example of Selfridge. He came from Chicago. He went to London with new ideas. He dared to advertise and do things that had never been heard of in London. His achievement is the marvel of every merchant in London. Dare a little and gain success; this is more than true if one desires to gain an entrance into foreign fields.

Manufacturers make their city, and they in turn make their country, just as women have helped to make Longchamps, Place Vendome, Piccadilly. All will be just as popular to the women from Fifth Avenue, Lake Shore Drive, or Michigan Avenue after the war as they were before. So manufacturers have made Nizhni Novgorod. They, there as traders, waste little time getting down to business. Everything is in full swing at 7 a. m. The consumption of tea, of course, plays an important part in transactions; and looking in at open doors or windows, one will see seated around tables, men with glasses of tea, driving hard bargains. The more important the trader the better the tea.

The great bulk of the dealers are people with little or no capital. They have to pay fairly high prices when they desire credit, but the arrangements enable them to handle a great volume of merchandise and it pays in the long run for any manufacturer to give consideration to this. They also like to take away catalogs that have been explained to them, and while business may not be done the first year in the items that have been illustrated to them, they come the next year to purchase. The jobber is, of course, avoided at these fairs, and he has been losing ground more or less in all parts of the world, the prevailing idea today being that as few intermediaries as possible should remain between the producer and the consumer.

ALL GIVE THEIR SERVICES TO COMMUNITY THEATER

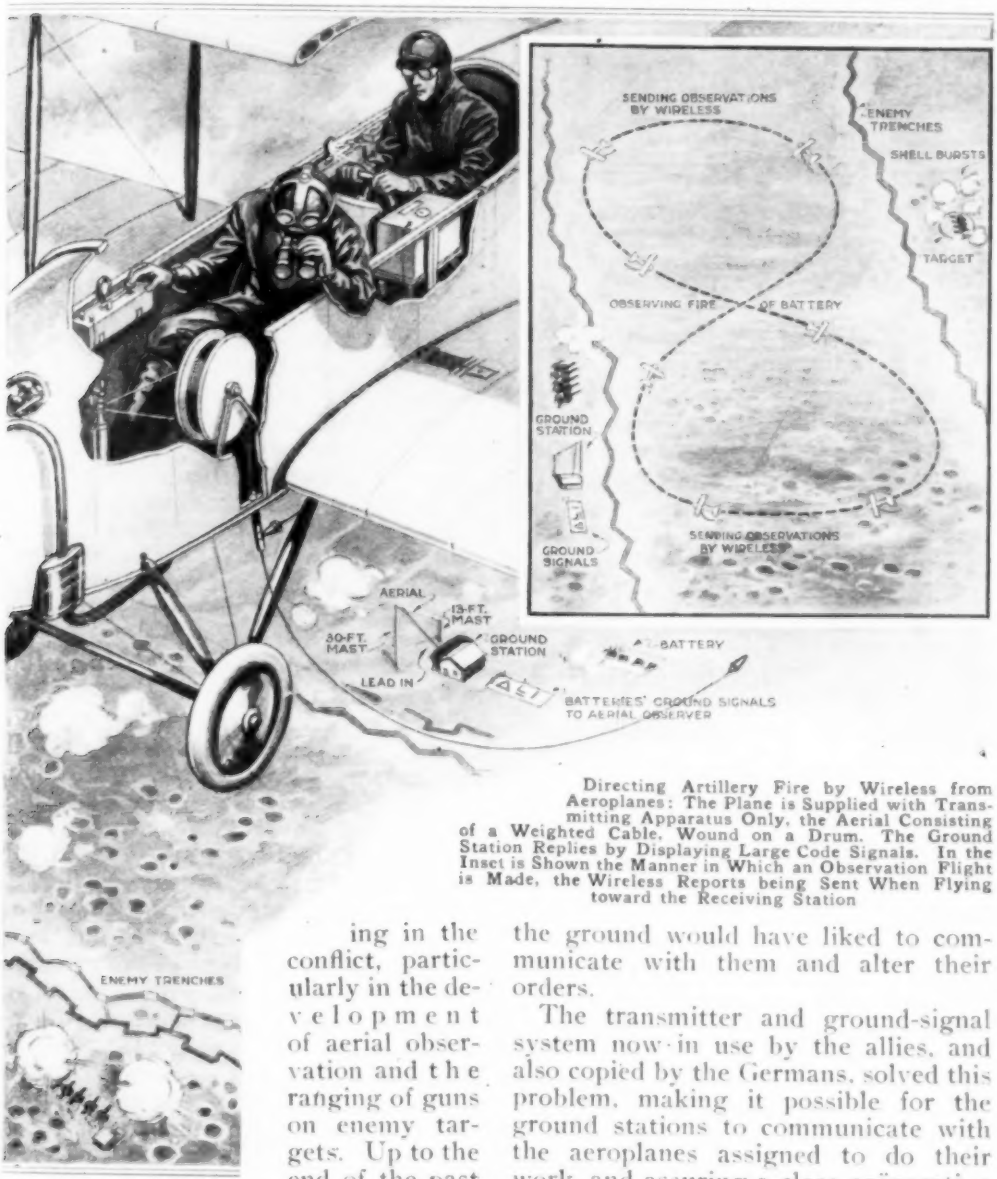
Having enlisted the services of many stage people in the vicinity, a group of public-spirited citizens in Hollywood, Calif., has recently established a community theater of a very interesting and distinctive sort. There is no commercial motive behind the enterprise and everyone connected with it, from the paper hanger to the playwrights and actors, donates his or her services. Funds raised from contributing members and by the sale of tickets, which cost 50 and 75 cents each, were employed in remodeling an old skating rink into a most attractive playhouse. The enthusiastic audiences that gather here show by their representative character that this is truly a community enterprise.

WIRELESS AS USED IN RANGE SHOOTS

By HENRY A. BRUNO

Formerly with the Royal Flying Corps, Canada

IN the early part of the present war there were many current reports as to the important part wireless was playing in the conflict, particularly in the development of aerial observation and the ranging of guns on enemy targets. Up to the end of the past summer, however, the great handicap to this work was that the air fighters and observers were unable to receive instructions after their plane had started on its flight over the battle lines. They had to depend entirely on their own initiative, and in many cases did admirable work, but there were often times when divisional commanders on the ground would have liked to communicate with them and alter their orders.



Directing Artillery Fire by Wireless from Aeroplanes: The Plane is Supplied with Transmitting Apparatus Only, the Aerial Consisting of a Weighted Cable, Wound on a Drum. The Ground Station Replies by Displaying Large Code Signals. In the Inset is Shown the Manner in Which an Observation Flight is Made, the Wireless Reports being Sent When Flying toward the Receiving Station

The transmitter and ground-signal system now in use by the allies, and also copied by the Germans, solved this problem, making it possible for the ground stations to communicate with the aeroplanes assigned to do their work, and assuring a close coöperation between the two. This system is in use only on the two-seater observation battleplanes and not on fighting scouts. It was designed, as one might imagine, primarily for artillery observation and has been remarkably successful in this.

The transmitter comprises a 4-in. spark coil and an adjustable spark gap, set inside an insulated box. On top of this box is an ammeter and a window made of an unbreakable composition, enabling the operator to see the spark,

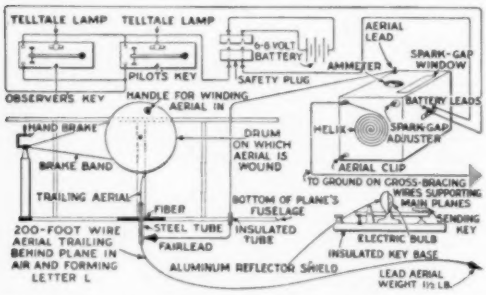


Diagram of Transmitting Apparatus: Dual Control is Provided, but So Arranged that Observer and Pilot cannot Both Use It at the Same Time

which may be adjusted by a handle at the side. A helix of heavy wire is fastened outside, on the front end of the box. This transmitter is securely clamped to the left side of the aeroplane's fuselage, in front of the pilot's seat, on a special stand so designed as to offset a great deal of the vibration caused by the propeller of the machine. The pilot always sits in the rear seat of these observation planes and the six to eight-volt batteries are placed at his right hand on the bottom of the fuselage. The transmitting key is set in a convenient place at his right elbow, in a position which will not tire him if sending for a long time.

The observer, who occupies the front seat, has a key fastened in the same manner as the pilot's, and each key has a small high-power telltale lamp, the invention of a young officer in the Royal Flying Corps, set on their base.

As these keys are interconnected, one can readily see that if the observer should be sending and the pilot absent-mindedly resting his arm on his own key, the receiving station would receive a long continuous dash, which would bring the wrath of the "O. C." (officer commanding) down on both men when they returned to their base. With this lamp attachment the observer can easily see when friend pilot is misplacing his arm, as the lamp flashes as he is sending. Should it stop and burn steadily, he knows the pilot's key has closed the circuit.

A simple, yet clever, solution of an annoying problem has been effected. There is a safety plug connected to the observer's key which, when pulled out, breaks the current, and aerial wireless men are impressed with the necessity of always leaving the plug out until ready to send. If the aeroplane were to be shot down with the plug still in, as has sometimes happened, the current might cause the machine to catch fire, but this is impossible with the plug out.

To the left of the observer is the drum on which the 200-ft. aerial is coiled, and the brake attachment by which the length of the aerial let-out can be controlled. This aerial is one of the things that make the system so unusual. It unwinds from the drum and passes through a steel tube set in fiber on the bottom of the fuselage. The connection from the transmitter box is made at the bottom of this steel tube and is called the "fairlead." The rush of wind caused by the aeroplane's swift flight through the air causes the aerial to swing out behind in the shape of the letter "L."

In order for the reader to understand clearly how this system works, it will be necessary theoretically to transplant him to a section of the western battle front. An observation battleplane is trundled out of a hangar, and pilot and observer prepare for a range shoot. While the observer tests out the wireless by inserting his safety plug and watching the spark, the pilot telephones to the battery commander, finds out the nature of the target, number of batteries going into action, kind of ammunition to be used and how much will be fired.

A few minutes later the plane ascends and wings its way over the batteries. The observer unwinds the aerial as soon as the machine is 600 ft. above the earth, then watches over the side as the pilot circles over the guns. He notices the aerial of the receiving station which is suspended from two poles, one 30 ft. and the other 13 ft. high. The lead-in

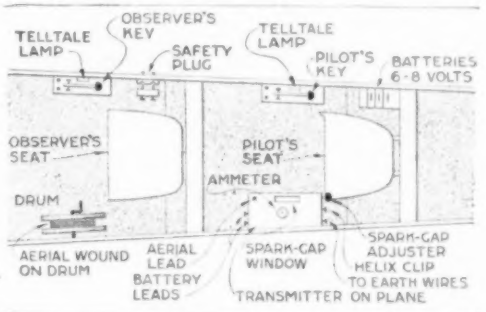
is from the top, and as the tallest pole faces the enemy's lines, a letter "L" is formed. A few seconds later his wireless is cracking away. He sends "U 8 D"—"U" being the aerial squadron call, "8" his personal call, and "D," meaning, "Are you receiving my signals?"

No doubt our visitor is wondering how answers are received, as there is no wireless receiving apparatus on the aeroplane. If one watches carefully he will see that in an open space just back of the wireless station a large, white-canvas letter "K" appears, which means "yes." The observer acknowledges this with "U 8 T," or general answer. Satisfied that the wireless is working well, he signals the pilot and the plane is turned toward the enemy's lines. With the target located, the pilot operates the plane up and down the lines at a height of 8,000 ft. and if antiaircraft guns are active he goes still higher.

As shown in the diagram, the path of the plane's flight forms a large figure eight. This also is a part of the system. Messages are sent only when the plane is flying toward the battery. The reason for this is that the wireless signals always travel stronger with the L-aerials when sent the same way as the machine is flying.

Having received orders to fire, the battery is sending shell after shell at the target. Not having to send while flying toward the enemy's lines, the observer has time to watch the bursts of the shells. He is in constant touch with the battery, as he can easily read the ground signals which are laid out in answer to his messages. By means of the L-aerials and the same wave length the ground station has no trouble in hearing his signals clearly. There is not space enough to describe the range shoot in detail, but eventually the target is destroyed and the aeroplane's work finished for the day. Once more the machine flies toward the battery, and this time the wireless spells out "U 8 Cl," that is, "I am going home." Over the battery both pilot and observer look downward and see the welcome "O. K." stretched out below.

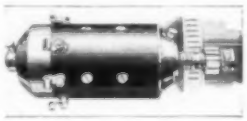
Back at the aerodrome again, before the aeroplane is put away for the night, wireless mechanicians take out the transmitter and aerial, as these are never left in the machines, but are placed in charge of the senior "N. C. O.," who is responsible for their condition. The fact that range shoots are playing such a big part in the operations on the western front shows the value of this system of radio signaling and how helpless big guns would be without aerial wireless to aid them in their work.



Arrangement of Transmitting Apparatus in Relation to Observer's and Pilot's Seats: As Will be Seen Each Has a Part of the Apparatus under His Control

NEW ELECTRIC STARTER OF FOREIGN DESIGN

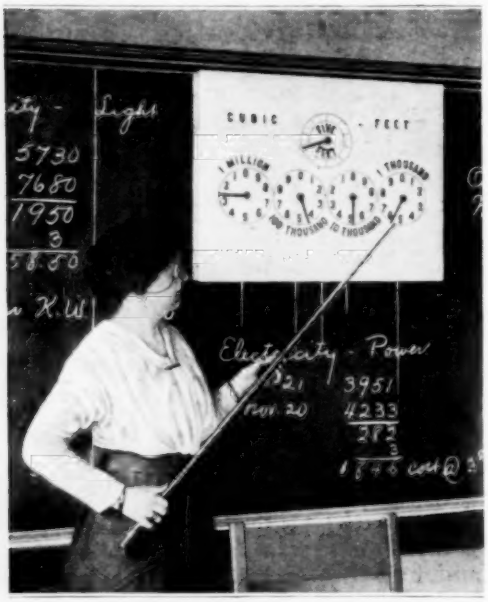
A new electric starter for gasoline engines recently brought out by a foreign company is of special interest because of its simplicity and the ingenious arrangement for throwing it into and out of gear.



The driving pinion is mounted on a screw thread on the end of the starter spindle. By placing a foot-operated switch in the first of two positions, the armature is drawn sideways by magnetic attraction, causing the pinion to mesh with the toothed flywheel of the engine. By depressing the switch still farther the speed of the starter is increased and the engine begins firing. When this takes place the pinion unscrews automatically and the starter is thrown out of gear.

SCHOLARS LEARN TO READ MODEL OF GAS METER

In order that all pupils in one of the Cincinnati high schools may be able to

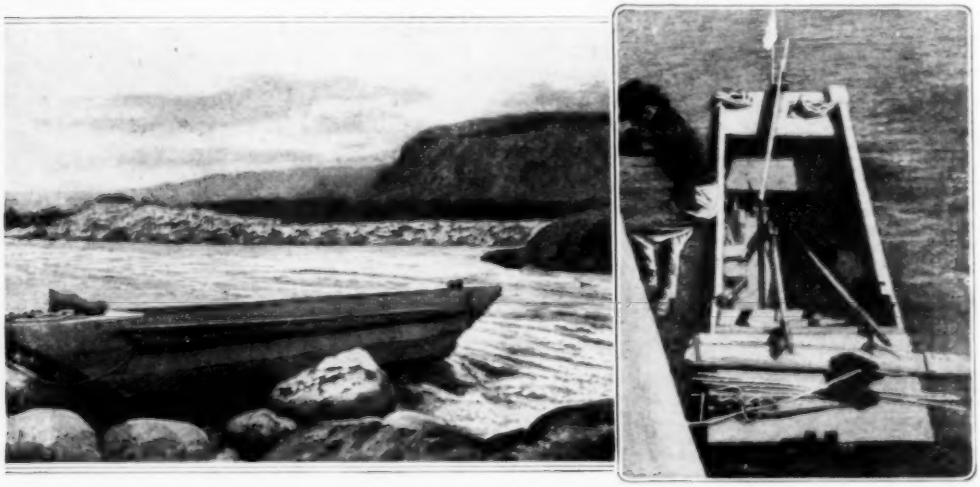


Model of a Gas-Meter Dial Used in a Cincinnati School in Teaching the Pupils How to Read the Meters in Their Homes

read the gas meters in their homes, the manual-training department has made large dials duplicating the face of the meters. The instructor operates the hands by means of cords, and so is able to set forth every variety of problem that the measuring devices themselves present. Electric-light readings are studied similarly.

DRIFT HUNDREDS OF MILES ON COLUMBIA RIVER

In much the same primitive fashion that explorers in the early days traveled this country's mighty rivers, two old western miners recently made a 650-mile trip on the Columbia River, drifting practically the entire distance. The craft, built especially for this trip, was made 25 miles from the embarking point and hauled overland to the river. It was 25 ft. long, had a flat bottom, and was equipped with sleeping quarters and a cookstove, but had no propelling means other than sweeps and oars. The journey was begun about 100 miles north of Spokane, at Kettle Falls, and terminated at Vancouver, Wash. At times the adventurers traveled 60 miles a day and on one occasion a rapids hurled the boat on the rocks, throwing the occupants overboard. Another rapids, seven miles in length, required cool heads and the utmost skill to avoid disaster. In 1908, these two miners, starting in Montana, went down the Yellowstone, Missouri, and Mississippi rivers in a similar fashion, traveling 3,500 miles.



The 25-Foot Flat-Bottom Boat Equipped with Sleeping Quarters, a Cookstove and Cooking Utensils, in Which Two Miners Drifted 650 Miles. Left: The Big Scow Shortly After It was Hurled on the Rocks

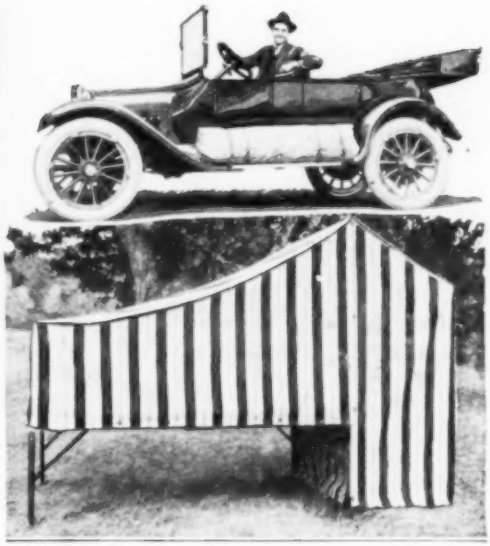
This View of the Interior Shows That the Headroom Is Ample

SHELTERED CAMP BED HAS DRESSING SPACE ALSO

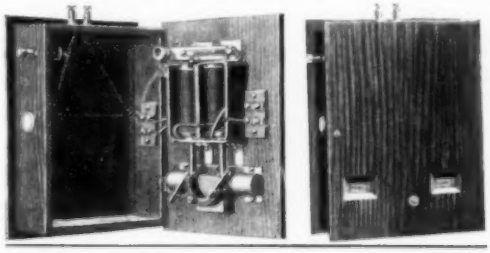
A folding camp bed inclosed in a canvas shelter, one end of which serves as a dressing room, has been devised to be carried on an automobile running board. The bed is raised well off the ground by folding legs. If necessary the sides can be closed down tight to keep out mosquitoes or the wind. The walls of the dressing room, which is at the head of the bed, are high enough to afford ample headroom.

METER WHICH REGISTERS TELEPHONE CALLS

A recently invented telephone meter is designed to prevent errors in charging calls and to make the service more satisfactory to the subscriber in other respects. Being of comparatively simple construction it can be installed in the signal case of a coin-operated telephone with slight alterations. The device comprises two counters which are actuated electrically and are located just back of apertures in the front of the case so that they are visible to the subscriber. One of the ways in which the meter can be used is as a substitute for the coin-operated signal. By pressing a button in the side of the case, connection is made with central and the call is registered by one of the counters. If the party does not answer, or the wrong number is obtained, central, on being notified, registers the call on the second, or credit, counter. The telephone bills may be computed on the basis of the totals shown. When the device is used with a coin-operated telephone it shows the subscriber at all times how many calls have been made.



In the Upper Photograph the Bed is Shown Strapped to the Running Board. In a Few Minutes It can be Set Up as Shown Below

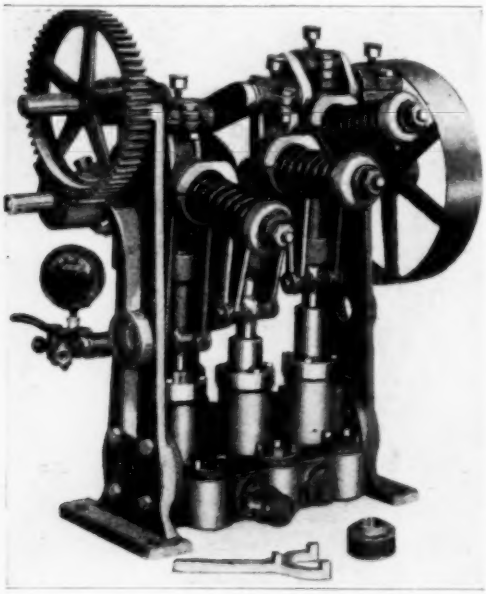


Interior View, Showing the Counters and Their Electrical Connections Installed on Inside of Door. Right: Exterior View of a Case, Showing the Credit and Debit Counters of the Telephone Meter

SPRAY PUMP IS EQUIPPED WITH PRESSURE GOVERNOR

Automatic pressure control is provided in a motor-driven spray pump that has of late been designed for orchardists, and others whose needs are not met by manual equipment. Without causing any interruption of the driving power, the plungers, when a predetermined pressure is reached, are stopped by spring-and-lever regulators

installed on them. The instant the pressure drops within the proper limit, operation is resumed. The scheme relieves the engine of its load and allows it to idle when the pump pressure becomes excessive. It also eliminates the use of a relief valve, which is often a source of trouble.



The Plungers are Stopped without Interfering with the Driving Power When the Pump Pressure Passes a Predetermined Limit

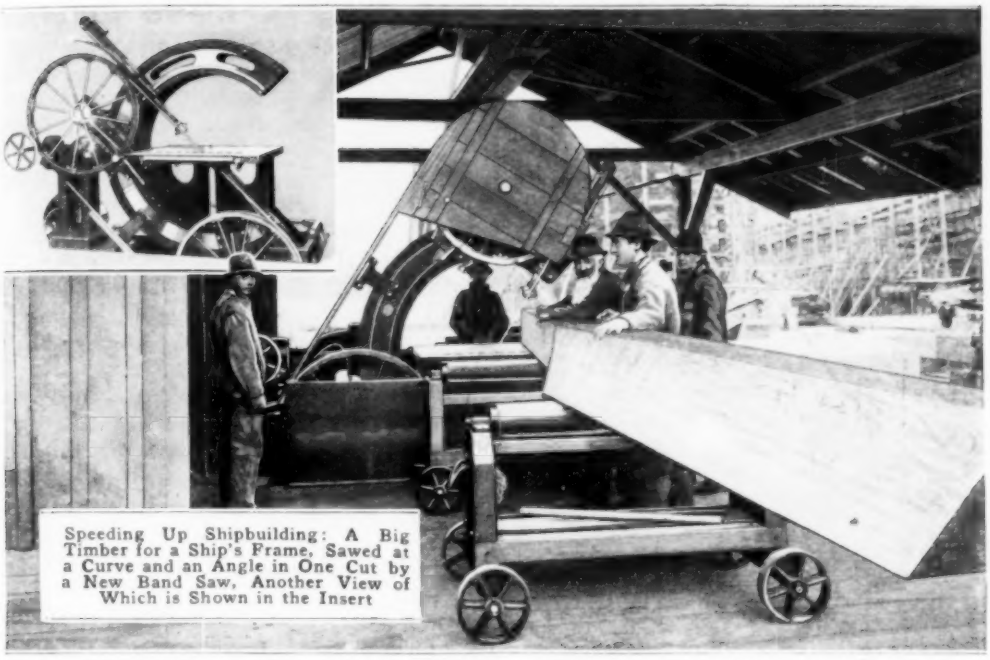
SECRET OF KING'S DEATH STEP NEARER SOLUTION

Science has failed to solve the mystery that for two centuries has made the death of Charles XII of Sweden one of the interesting enigmas of Scandinavian history. It will be recalled that last summer the body of the former monarch was exhumed and for seven days examined by a group of eminent authorities. Their report, lately completed, does not identify the hand that slew the "madman of the North," but it does supply exhaustive technical data that will be of much value when the problem, which is now a ballistic and topographical one, is taken up by military science. The king fell while in the first-line trench before the fortress of Fredriksten during the war with Norway in 1718. His slaying has been called the work of a "dubious hand," for it has never been known whether a ball from a Norwegian gun, or from one in the hands of an assassin, pierced his skull. It was expected that with the aid of the X-ray and other modern apparatus the scientists would be able to determine whether the shot was fired at close range or at about 280 paces, the distance that separated the battle lines. They hand the problem down to engineers, however, by reporting that, "in view of the great size of the wound and the splitting of the skull, the possibility of a shot near at hand cannot yet be regarded as excluded."

BRONZE FIGURE OF AN ELK PLACED IN CEMETERY

A striking monument erected by an Elk lodge in the cemetery at Ingleside, Calif., consists of a large figure of an elk in bronze, mounted on a pedestal of granite, carved to resemble a portion of a cliff. The tips of the elk's antlers are 32 ft. above the ground. An unusual feature of the unveiling was that it took place at 11 o'clock at night, which is the symbolic hour of the lodge.

Unusual Monument Erected by an Elk Lodge in a Cemetery at Ingleside, California



Speeding Up Shipbuilding: A Big Timber for a Ship's Frame, Sawed at a Curve and an Angle in One Cut by a New Band Saw. Another View of Which is Shown in the Insert

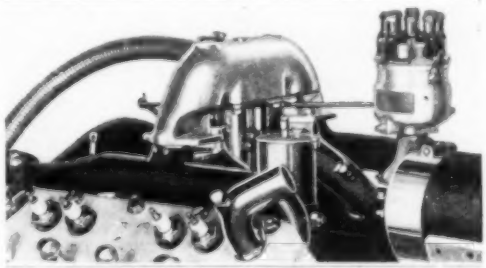
WOODEN-SHIP CONTRACTORS AIDED BY NEW BAND SAW

Heeding the nation's cry for more ships, a firm manufacturing woodworking machinery has lately placed on the market a band saw designed especially to meet the requirements for building wooden vessels. Already it has been widely adopted because of its strength and adaptability for cutting both the straight and the curved parts of ship frames. The two large wheels around which the saw passes are so mounted that the blade can be set for any angle within 45° to the right or left of perpendicular, while the machine is operating. It may be set by power or by hand, the hand adjustment being intended for especially fine work. Heavy guards are provided for the upper and lower wheels, as well as between the two wheels, leaving exposed only that portion of the blade that is in use.

¶ According to the annual report of the Federal steamboat service, out of a total of over 300,000,000 passengers carried on boats under its supervision in the past year, only 71 lost their lives.

POOR GAS CAUSES ADOPTION OF VAPORIZER FOR MOTOR

To assure satisfactory vaporization of the low-grade fuel that automobilists are compelled to use at present, a heated induction tube has been installed as standard equipment on the engine of a well-known motor car. The contrivance is a cored aluminum casting attached to the intake manifold. Its inner passage receives the gas from the carburetor and feeds it to the two blocks. The gaseous products of combustion from both of the four-cylinder blocks travel through the outer compartment of the casting and heat the

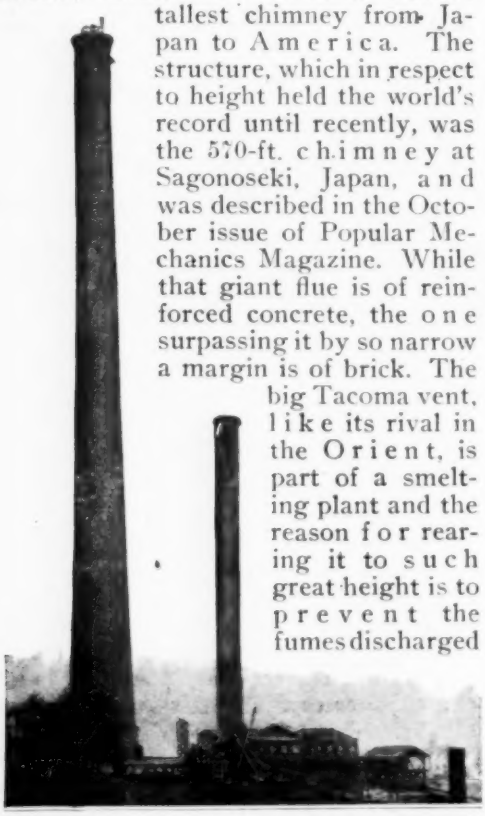


In Passing through the Cored Casting, the Exhaust Fumes Heat the Carbureted Gas Before It Reaches the Cylinders

carbureted fuel. The fumes are carried to the exhaust pipe by a flexible tube, at the entrance of which is a regulating valve that controls the heat, so as to vary it as required.

NOW AN AMERICAN CHIMNEY IS TALLEST IN WORLD

The completion a short time ago of a chimney, 571 ft. high, in Tacoma, Wash., transfers the title of the world's tallest chimney from Japan to America. The structure, which in respect to height held the world's record until recently, was the 570-ft. chimney at Sagonoseki, Japan, and was described in the October issue of Popular Mechanics Magazine. While that giant flue is of reinforced concrete, the one surpassing it by so narrow a margin is of brick. The big Tacoma vent, like its rival in the Orient, is part of a smelting plant and the reason for rearing it to such great height is to prevent the fumes discharged by it from harming vegetation, particularly in a park close at hand.



A Tacoma Smelter's New and Old Chimneys: The Former, 571 Feet High, Is Now the World's Tallest Chimney, Being a Foot Higher Than One in Japan

¶The government desires to discourage the practice being followed by some merchants of accepting Liberty bonds in place of cash, the reason being that it tends to depress their market price and so makes it less easy to sell future issues.

EL PASO PLANS TO UTILIZE WASTE WATER FOR BATHS

Public baths, costing much less to maintain than those in the average American city, have recently been planned for El Paso, Tex. The project has been in charge of a committee appointed by the local chamber of commerce which investigated public-bath facilities in 61 leading municipalities. This body proposes that the city utilize waste water from local refrigerating plants which is used for cooling purposes and then discharged into the sewers. From this source 2,000,000 gal. of heated water could be obtained daily, it is said. This water is entirely suitable for baths, being in no way contaminated in the process of cooling.

The investigators found that in cities of 60,000 to 75,000 population, the public baths were used from 4,000 to 10,000 times monthly. With a maximum number of bathers, it is estimated that the proposed method of supplying water would result in saving $1,200 to $2,000 per month. The present plan is to erect a building containing eight shower baths, at a cost of $1,500, which will have running water day and night. For sanitary reasons no pool or tubs will be provided.

UNIVERSITY WOULD BREAK GERMAN DYE MONOPOLY

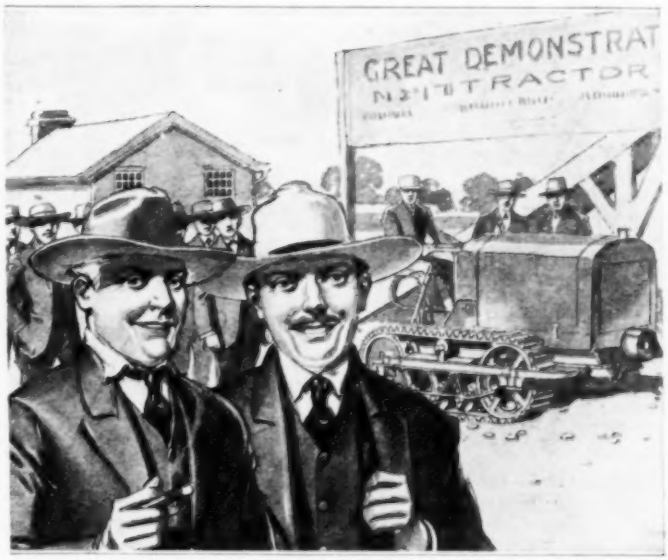
As a step in bringing about closer relations between scientists and business in America, an industrial fellowship has been established by the University of Chicago for the scientific study of methods for producing the most delicate dyes. The school is also accepting other such fellowships, the expenses of which are met by manufacturing concerns. In studying the production of coloring stuffs it is hoped to develop processes that will make America independent of Germany, which now holds a virtual monopoly on the choicest dyestuffs—a condition which, after the war, would give that country control of much of the colored dress-goods production.

MOTION-PICTURE EVIDENCE

By FRANK KAVANAUGH

THE motion-picture machine is becoming as important an adjunct to court practice and securing evidence as the average sleuth once was.

A recent damage suit was settled in Los Angeles solely by evidence of a motion picture. A woman sued the street-railway company for damages sustained while alighting from a car. She claimed to have been permanently injured so that she was no longer able to perform her usual household duties. When the case came to trial the court room was darkened and a picture shown wherein the woman was washing, hanging out her clothes after having washed them, and splitting kindling wood. Evidence in this case, however, would have failed to convince the jury, as the defense contended the pictures had been taken before the accident occurred. During the operation of the machine, however, while the operator was concealed in a position which enabled him to secure a good picture of the plaintiff, the machine turned so that it took in a portion of a neighboring billboard. On this was the advertisement of an operatic entertainment. It was easily proved that the advertising matter was placed on the billboard after the date of the accident, and the jury found for the defendant.



"The agent sold tractors to many farmers who would not purchase before seeing their friends and acquaintances in pictures at the demonstration."

"When the case came to trial the court room was darkened and a picture shown wherein the woman was washing, hanging out clothes, . . . and splitting kindling wood."

Finding the sale of stock in an oil company not meeting expectations, the fiscal agent caused motion pictures to be taken of the two wells already in operation by the company in a new mid-western oil field. The wells were

identified by means of suitable signs and "close-ups" of the officials of the company. In this way intending purchasers of stock were convinced that the proposition was a good one, and heavy sales of stock resulted.

"After the strike had been settled to the satisfaction of both sides, several of the strikers asked to see the 'pictures in which they acted.'"

At a recent tractor demonstration near Hutchinson, Kan., motion pictures were taken of the work, as well as of well-known farmers who expressed their satisfaction with the work of the machine before the camera. The resulting pictures were shown in the schoolhouses throughout the county, and the agent sold tractors to many farmers who would not purchase before seeing their friends and acquaintances in pictures at the demonstration.

On a piece of new railway construction in the Southwest the financial backers of the project in an eastern city became dissatisfied with the progress of the work and were about to discontinue it. The engineer in charge, realizing that his job was about to end, had motion pictures made of the work and they were sent east, where they were shown to the parties interested. The work was financed to completion and the engineer is still on the job.

Another example of extraordinary use of moving pictures occurred during a recent packing-house strike, when one of the packers caused motion-picture machines to be placed at points where any demonstration by the strikers would take place. In some manner the strikers learned of the fact, and, although they would have resented the placing of riot guns at such points, the motion pictures seemed to strike their sense of humor, and instead of making any hostile demonstration, they marched and countermarched before the plant, taking pains to display their best behavior. After the strike had been settled to the satisfaction of both sides, several of the strikers, most of them foreigners, asked to see the "pictures in which they acted."

WARMTH AND STYLE OBTAIN IN LEATHER MOTOR COAT

For the young woman of discriminating taste in toggery, an ultra-smart motor coat has been fashioned in leather of deep purple. A velvet collar of rich tan hugs snugly about the neck, while at the waist a pinch-belt effect draws the garment to a trim fit that lends a striking dash of style. Warmth, the primary consideration in coats of this character, is not attained at the expense of refinement. Good lines and fit, comfort and grace are the harmonies that combine to make the model attractive for the young maid who motors in winter when the weather calls for warm apparel.

COPYRIGHT BY UNDERWOOD & UNDERWOOD

HYDROELECTRIC PLANT RUNS AUTOMATICALLY

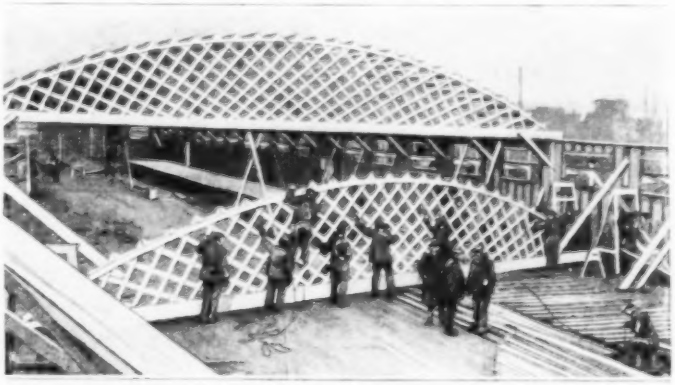
A southern sawmill, turning out some 80,000 feet of lumber daily with band-saw machinery, runs by electricity generated in a hydroelectric plant that is entirely automatic in its operation. The power plant is two miles from the sawmill and is unattended. It derives electric energy from dynamos driven by water brought under pressure in a 140-ft. wooden flume. The current thus generated operates 28 motors in the sawmill, ranging from three to 150 horsepower. A steam engine is used only for operating the log-conveying machinery. Electric controls regulate the operation of the dynamos in the power house.

In This Isolated Little Building Sufficient Electric Power is Generated to Saw 80,000 Feet of Lumber Daily

This Sawmill is Operated with Automatically Generated Electric Energy

ECONOMICAL ROOF TRUSSES FOR CAMP BUILDINGS

To meet the demand for long roof spans for certain military-camp buildings in Canada, a contracting firm has devised a roof truss that is strong but neither difficult nor costly to construct. The lower horizontal member of the truss is straight and is made of heavy planks, while above it springs an arch, extending from end to end, made of lighter material. Connecting these two are numerous bracing ribs placed diagonally to resemble latticework, their upper ends projecting above the arched member, and forming seats in which the purlins fit and are held securely. In the construction of these trusses a relatively small amount of heavy lumber is required, and many short pieces may be used.

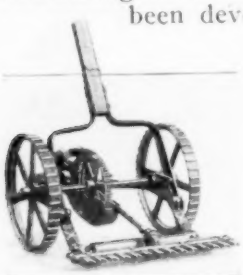


COURTESY ENGINEERING NEWS-RECORD

View Showing a Type of Roof Trusses Employed in Building Canadian Camp Structures in Which Long Roof Spans were Demanded: The Trusses Are Easy to Make and Their Cost Is Relatively Low

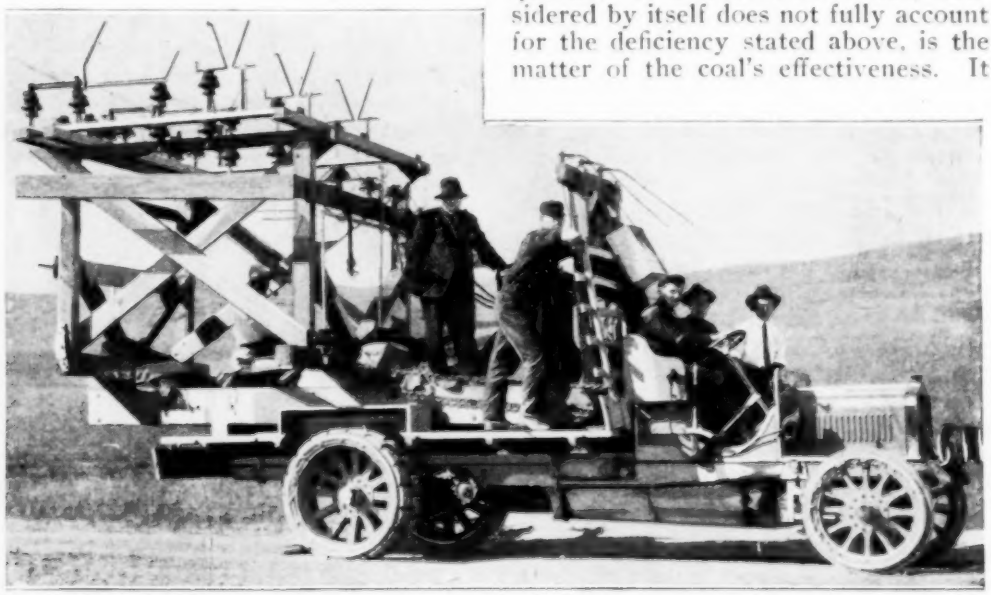
LAWN MOWER SHEARS CLOSE TO TREES AND FENCES

A lawn mower, with cutting parts resembling those of a farm mower, has been developed, which cuts grass or weeds, tall or short, and may be used to advantage in mowing close to trees or fences. The 18-in. toothed blade is oscillated by a double cam on a shaft placed at right angles to the axle. Mounted on the latter is the gearing that drives the cutter shaft and also a flywheel.



SUBSTATION SET ON TRUCK AIDS IN DIGGING CANAL

In digging an irrigation canal whose route was paralleled by a high-tension line, out-of-the-ordinary methods were used to make the electric current available for operating the scrapers used in excavating. Since the ordinary stationary equipment was obviously impractical a substation and the necessary transformers were mounted on trucks and located near the point where the line was tapped. As fast as the work progressed the trucks were moved along the canal.



An Electrical Substation Mounted on an Auto Truck: Part of the Portable Outfit Utilized in Supplying Power from a High-Tension Line, for Canal-Excavating Machinery. As the Digging Progressed, the Substation and Transformers, Similarly Mounted, were Moved Forward

WHY FUEL VALUE OF NEW COAL IS LESSENED

Careful estimates made by the director of the Bureau of Mines and his associates indicate that while last year's coal output of 600,000,000 tons will probably be increased to 650,000,000 tons this year, the effectiveness of this fuel will be equivalent to a production of normally prepared coal aggregating only 570,000,000 tons. The reason for this surprising discrepancy is that much of the coal is not being prepared with the usual care. It is calculated that there is 5 per cent more ash content in this year's coal than in that of previous years. In other words, approximately 600,000 carloads of ash are being added to the burden borne by the railways.

But even more important than the question of ash content which, considered by itself does not fully account for the deficiency stated above, is the matter of the coal's effectiveness. It

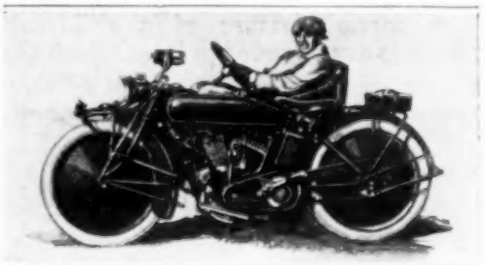
has been shown that the inclusion of 5 per cent more ash in the coal means a reduction in efficiency in the remaining good coal of 7½ per cent. Stating the case another way, the total reduction in the coal's effectiveness is 12½ per cent. This percentage, applied to the present year's probable output, reduces its fuel worth to less than last year's output, as stated above.

COMPUTING MACHINE BUILT FOR LUMBER BUSINESS

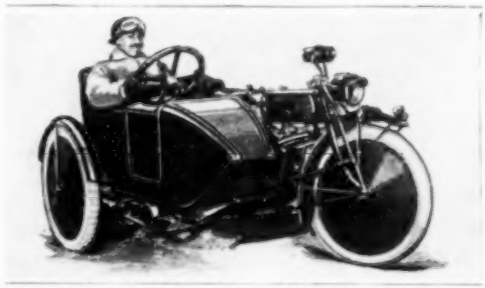
To reduce the arithmetical work and accompanying errors with which lumber dealers contend when filling orders, a special calculating machine has been brought forth. It simplifies the computation of board footage by making the tally man's duties similar to those of an adding-machine operator. By the ordinary system, when handling a large amount of material of various lengths and widths in bundles containing varying numbers of separate pieces, tedious figuring cannot be escaped even with the aid of lumber tables. With the machine, however, the operation of a few keys and a lever is all that is necessary, and accuracy is assured.

AUTOMOBILE CONTROL GIVEN MOTORCYCLE COMBINATION

By installing a steering wheel in the sidecar, a Spanish sportsman has converted a motorcycle combination to a near-automobile. Instead of riding astride, he occupies the seat intended for a passenger and travels like a full-fledged motorist. Arms attached to the front forks join at the rear with a connecting rod to the rack member of a rack-and-pinion steering gear mounted at the front of the sidecar. The throttle and spark controls are attached to the wheel, while the clutch and brake pedals are fitted in the floor of the body. No change was made in the gear-shift levers. Disks were applied to the three wheels.



Only a Few Simple Changes were Made in Converting the Motorcycle Combination into a Near-Automobile



The Outfit Created a Marked Sensation When It Made Its First Appearance at a Gathering of Cyclists in Spain

FINGER PRINTS ON NAVY'S IDENTIFICATION TAGS

The accompanying illustrations give an excellent idea of the two sides of the navy's new identification tag, already described in Popular Mechanics Magazine. Each man in the service is to be provided with two of these disks, which are of Monel metal and are very durable. In addition to the name of the bearer and the date of his birth and enlistment, each tag is etched with his finger print.

Two Sides of One of the Identification Tags Supplied by the Navy to the Men in the Service

CHILD'S SWING OPERATES ON NEW PRINCIPLE

A special feature of a children's swing is a suspended pole on which the occupants can pull, making it easy to

Children's Swing That is Made to Oscillate by Pulling on the Handles Attached to the Pole Suspended from the Crosspiece

oscillate the seat without jerking or shifting their balance. The seat is suspended by rods from a crosspiece to which the pole is pivoted. A pull on the handles, attached to the pole, causes a plunger at the latter's upper end to engage temporarily one of the openings in a sectorlike member, securely mounted above it, at the same time imparting the desired impulse to the swing.

SAFEST WAY TO DODGE A TORNADO

Careful study of tornadoes made by the United States Weather Bureau, shows that an intelligent understanding of these natural phenomena and the manner in which they manifest themselves will often enable one to avoid danger. The local signs of a tornado are heavy dark clouds, first in the southwest, almost immediately followed by clouds in the northwest and north. A funnel-shaped cloud is a sure sign, though there may be a tornado when such a cloud is not readily seen. Frequently, even though one cannot see the funnel, the proximity of a storm of this violent type may be detected by the whirling motion of the air, which is made known by a peculiar roaring noise, somewhat like the rumble of distant thunder or the approach of a heavy train. If one can see a cloud and get an idea of the direction in which it is moving, the zone of safety is at right angles to the direction of motion. It should be remembered, too, that the southern margin is usually more dangerous than the northern. Ordinarily the path of greatest destruction is not over a few hundred yards wide, so that escape is usually less difficult than it might seem.

BARRELS HANDLED EASILY WITH CRANK-AXLE TRUCK

By means of a new truck, the axle of which is shaped in the form of a crank, one man can easily move a barrel weighing 1,000 lb. or more, it is claimed. The truck is placed alongside a barrel, in a vertical position, and an adjustable bail is dropped over the upper end

A Truck Which Balances Its Load so That a Barrel can be Tilted Easily and Moved with a Minimum Effort

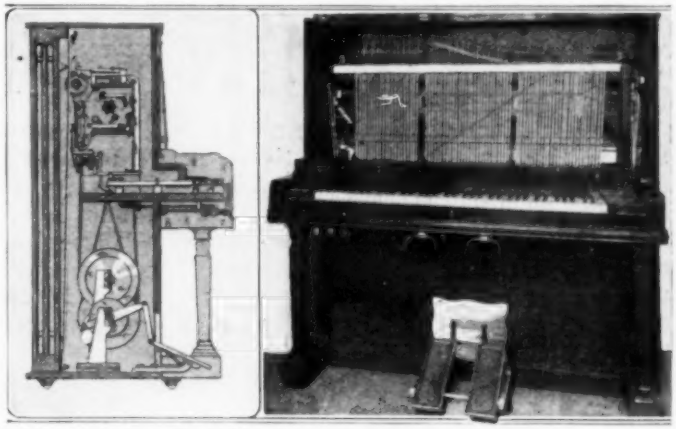
of the container, clamping it securely. On drawing the handles backward, the barrel is tilted and lifted from the floor, jaws on the crank axle aiding in the operation. This brings the load into a position in which it balances almost exactly.

CONSERVE SOFT CORN BY PARCHING IT

For the purpose of conserving a large amount of soft corn that was harvested last fall, an experienced farmer has prepared it for feeding by parching it. Hogs and poultry appear to relish it, while other stock will eat it when mixed with sound grain. Corn prepared in this way will keep indefinitely. The farmer's method is to build a fire of wood or corncobs and allow it to burn down to a bed of coals and ashes. When the fire has subsided sufficiently, the corn is scattered over the coals and ashes and stirred from time to time. It has been found that about the same degree of heat is needed as is required in popping corn. This is sufficient to kill all harmful elements in the grain. When one lot of corn has been parched it is drawn off with an iron rake and another put in its place.

TURNING DISKS GIVE PIANO SUSTAINED NOTES

Sustained notes similar to those of a violin are produced by a piano supplied with small disks that rotate in contact with the strings when the keys are depressed. The revolving members are actuated by foot power or motor, and are kept in condition by rubbing against pieces of rosin. A special mechanism is employed to provide a tremolo effect when it is desired.



Operated by Foot Power or Motor, the Instrument is Played Like an Organ and Produces Full, Sustained Notes

TAKING PRISONERS

By E. T. B.

AN idea persists in many quarters today that at any time a combatant gets into a place too tight for his courage, or a place where continued opposition to an overwhelming force means nothing but useless suicide, all he has to do is to surrender. The popular idea of this giving up in the face of odds is symbolized by the photographed silhouettes of Germans, walking toward the allied trenches with hands held aloft, and crying, "Mercy, Kameraden!"

The truth is much sterner than this. Neither a German nor a fighter under the allied flags has this privilege always. In fact, more than half the soldiers who actually desire to surrender, and who would most certainly do so if given the opportunity, are forced to fight to the end.

Prisoners cannot be taken by either side except at certain stages of the combat!

Under the instructions issued to our boys at the cantonments today, given to the officers at the Reserve Officers' Training Camps, and used by the armies of the allies and such of our troops as have figured in attacks thus far, no prisoners can be taken until all objectives of the sector of the attack in question have been established.

Let us illustrate this. In most nor-

mal attacks today the battalion is the unit. In the case of a "big push"—that is, an attack which extends over five miles or more of front—the regiment, an elastic body consisting of any number of battalions (under the army system adopted by France, England, and Italy, and which probably soon will be adopted by the United States War College) sometimes is the unit, but not often.

The battalion usually forms a wave, and is given a definite objective. If there are only three waves, each battalion's objective may be one of the three opposing trenches. The time card of attack will designate the hour of advance (zero hour), the kind of barrage (box, creeping, or lifting), and the method of advance behind the barrage. Also the card will state exactly the minute and second that each objective should be gained.

In making out these cards no more time is allowed than is deemed absolutely necessary, for seconds wasted in accomplishing the purpose of an attack account for scores of killed and wounded.

The way it all works out is that every ounce of offensive strength possessed by a battalion is needed all of the time until the trench is taken, new trench is made, and the immediate counter-attacks repulsed. Prisoners might stop the advance as effectually as a large body of men brought up as reserves in the opposing trench, for they would demand an escort to the rear.

In the case of a sudden attack no lines of communication to the rear have been established. These have to follow quickly, of course, else ammunition will give out among the capturers of the trench, but the ammunition runners—brave men who take three-to-one chances with death across the unprotected waste of No Man's Land that they may bring up cartridges and grenades to the defenders—have no time or inclination to escort captured Germans back of the lines. It stands to reason that until safe means of communication with the rear have been established, it is suicidal for the attacking party to waste time with prisoners. It is not a pretty thought but *c'est la guerre!* The same syllogisms and conclusions were discovered and acted upon by the German armies long before the allies were able to do more than strain heart, soul, and body in attempting to stem the seemingly inexorable tide of Teutons. Now that the allies in turn are doing the major portion of the attacking, they have had to adopt exactly the same measures. Where tactics and the promptings of humanity clash in war—well, tactics cannot lose.

These principles are general, of course, and apply to all armies in the field. In certain quarters deep-seated grudges are nursed; certain regiments would not take an enemy prisoner if he brought a prince's ransom with him.

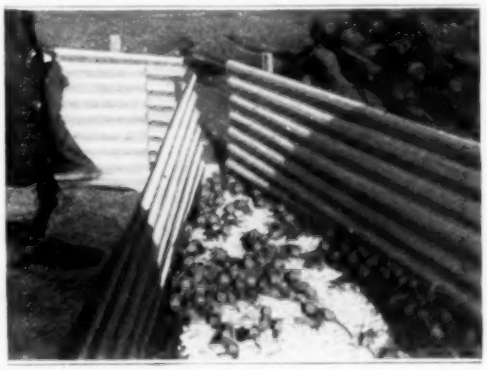
The most spectacular of these grudges, perhaps, is between the Black Watch regiment of Canadians and the Prussian Guards. It is not necessary to detail all of the horrible atrocities which gave cause to this terrible super-animosity; one instance will be sufficient. To begin with, the Canadians had no more feeling against Prussians than they had against Austrians or Turks. All were enemies, of course, and to be vanquished, but each individual Prussian was regarded as a human being. When he tried to surrender, the Canadians were all too glad to strain a point, if possible, and allow him to do so. One day, however, two lieutenants were wounded, both from the Black Watch. A German patrol captured them. Three days later the sweep of the Black Watch attack gained the particular trench to which they had been taken. The two lieutenants had been crucified to wooden stakes and left to die . . . Now any German that looks like a Prussian Guard to a Canadian has no chance to save himself by surrender, and the same idea has been adopted by the guards themselves.

¶The fire-alarm apparatus in Camp Dix, N. J., has recently been supplemented by a wireless fire-alarm system.

A Big Wheat Depot at Port Pirie, Australia, Where Thousands of Bags of Grain are Awaiting Transportation: The Shortage of Ships and Plague of Mice have Caused Great Loss

MICE RUIN WHEAT AT AUSTRALIAN DEPOTS

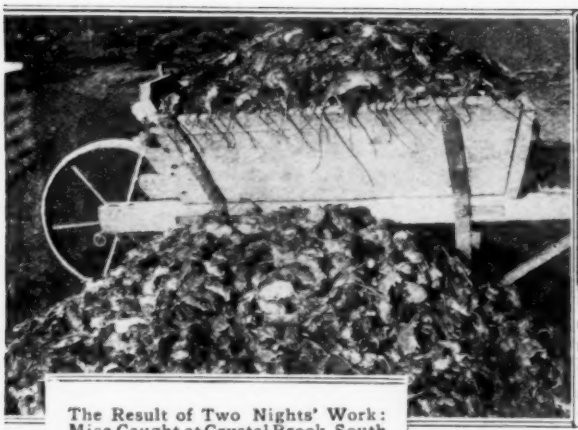
Immense quantities of Australian wheat have been destroyed in the states of South Australia, Victoria, and New South Wales by enormous armies of mice. Lack of adequate shipping facilities made it necessary to stack millions of bags of grain in the open air at different points until they could be moved. A plague of mice followed. With startling alacrity the vermin devastated, before they could be successfully combated, many of the great stores. The ravage has been checked, however, by an inexpensive and patented method that has enabled the annihilation of tens of thousands of the pests in the course of a night.



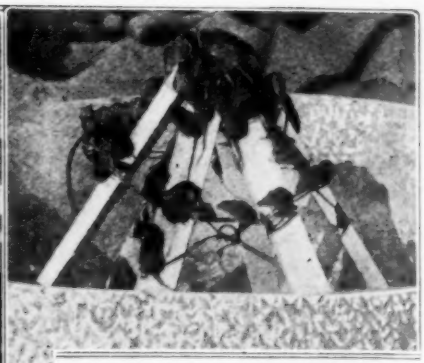
COPYRIGHT
Herding Mice between the Converging Walls of a Runway That Terminates in a Deep Pit

In meeting the crucial situation the stacks have been surrounded

The Work of Mice: When an Army of These Ravenous Little Rodents Undermines a Grain Store, Irreparable Damage Results in Short Order. A Satisfactory Method of Combating the Ravage has been Evolved and Applied



The Result of Two Nights' Work: Mice Caught at Crystal Brook, South Australia, after Building the Trap System around the Grain Store



Showing How the Little Fellows can Scale Nearly Any Kind of a Structure Except a Smooth Wall

An Insect Is Not a Better Performer than a Small Gray Mouse When It Comes to Walking a Tight Wire

The Effectiveness of the Double-Fencing System is Illustrated at the Left. The Hole Is the Burial Place of More than 100,000 Mice Captured at One of the Wheat Depots

COPYRIGHTED

Only Four Nights were Spent in Corralling and Killing This Pile of Rodents, Which Contains a Half Million of the Pests with an Aggregate Weight of about Eight Tons

COPYRIGHTED

Waste: More than 6,000 Sacks of Wheat Reduced to a Sickening Dump Heap by a Voracious Host

Showing the Character of the Runways Built around the Wheat Piles and a Number of Mice Removed from One of the Pits

COPYRIGHTED

COPYRIGHTED

Mice in a Pit, Trying to Escape Asphyxiation: Note How Fat They Are

Empty Sacks are Laid over the Outer Sides of the Opposite Walls so That the Mice will Enter the Runway When Attempting to Go to or from the Grain

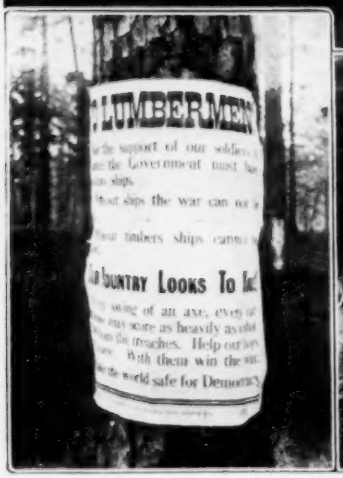
COPYRIGHTED

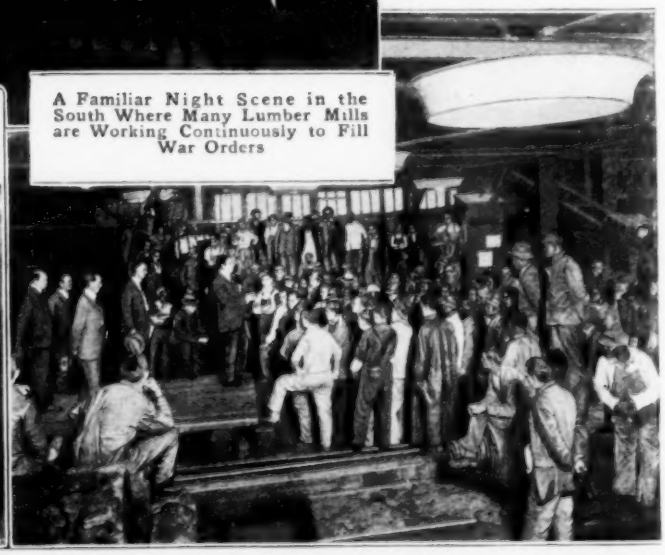
by double walls, built of corrugated iron to a height of about two feet. Such a barrier is so constructed that it forms a series of runways with converging sides. The open ends of the sections terminate in deep pits. By hanging empty sacks on the outer sides of the walls at intervals of several feet, provision is made for enabling the mice to gain entrance to the runways when attempting to go to or from the guarded stack of wheat. Once they are trapped in one of the passages, they are doomed. It is a simple matter to herd them between the narrow walls to the pits. Their destruction is then accomplished with asphyxiating gas. As an example of the effectiveness of this trapping system, approximately 500,000 mice were captured in four nights at a grain store.

TALKS STIR LUMBERJACKS TO PATRIOTIC EFFORT

For the purpose of raising the lumber production in our southern states to a maximum, an association of companies now making special efforts to fill government orders for ship timbers, and the like, has been conducting a patriotic campaign in the lumber camps throughout the region extending from Florida to Texas. Able public speakers, chiefly volunteers, have gone into the forests and held stirring meetings that have given the lumbermen, white and black, a new understanding of the shipbuilding problem. Supplementing these addresses, huge posters containing pointed appeals have been tacked to trees and mill walls so that all might read them. Officials of the association predict that the wooden-fleet program will be well ahead of schedule by the middle of next summer.

A Familiar Night Scene in the South Where Many Lumber Mills are Working Continuously to Fill War Orders





Left: A Placard Posted in a Southern Forest, Appealing to Men to Help Win the War by Increased Production. Right: Patriotic Meeting in a Southern Pine Mill That is Running 24 Hours a Day to Fill Government Orders

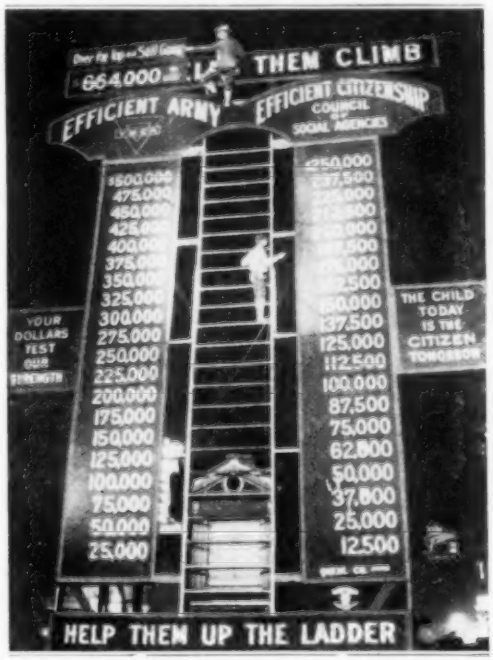
Scene in an Automobile Display Room, in Which a Touring Car, Strangely Painted, Merges into the Landscape as Part of a Stone Wall

CAMOUFLAGE EMPLOYED IN AUTO SHOW ROOM

A clever example of the camoufleur's art has been employed by an automobile company in this country to attract attention to its showroom. The scene presented is that of a countryside with a lake in the distance, a cliff at the right, and a stone wall in the left foreground. A real automobile stands by the wall, but it has been so painted that a short distance away its presence cannot be detected. The body appears to be part of a stone wall, in front of which stands a sapling.

LADDERLIKE SIGN SHOWS PROGRESS OF "DRIVES"

A particularly effective sign, employed in Cincinnati to stimulate enthusiasm in a recent money-raising "drive," resembled a ladder, on either side of which was a column of figures, one set being devoted to subscriptions for the army Y. M. C. A. and the other to gifts for local charities. As the campaign progressed, a figure representing a soldier mounted the ladder, pointing to the total of Y. M. C. A. pledges received, while a second figure, representing a boy, indicated the sum of the gifts to the organization representing all of the local charities. Eventually both fig-

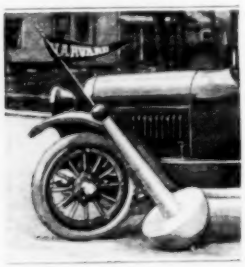


The Changing Positions of the Two Figures on This Sign Indicated the Progress of Two Money-Raising Campaigns

ures reached the maximum stated and the subscriptions for the soldiers so far exceeded the total provided for, that a board showing the proper amount had to be made and placed well above the ladder. It was appropriately labeled, "Over the Top and Still Going."

MOVABLE TRAFFIC POST IS SELF-RIGHTING

A movable, self-righting traffic post is being installed at many street intersections where conditions do not warrant stationing an officer. It rests on top of the pavement and consists of a heavy hemispherical base from which projects a post that normally stands upright and may serve to support a sign. A car accidentally striking the post will swing it over on its side without doing serious damage to the vehicle, and when the latter has passed it rights itself.

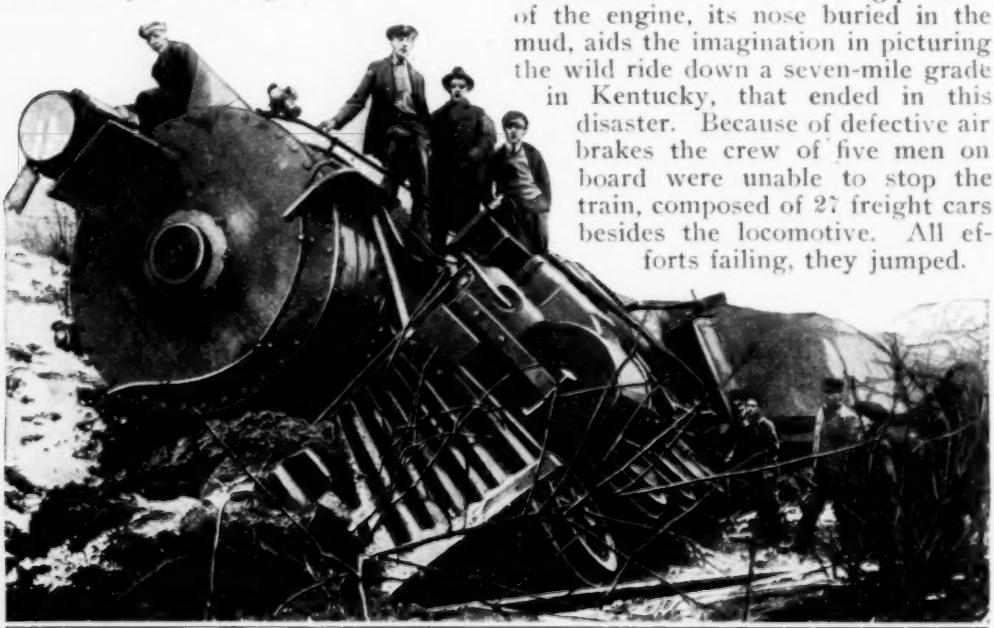


BRITISH TANK EMPLOYED AS WAR-SAVINGS BANK

The "tanks" have been put to a new and very effective use in the war against Germany, one at least having been transformed into a war-savings bank in London from which bonds and certificates were sold to thousands. The big engine of destruction was recently set up in Trafalgar Square, surrounded by posters. On the first day the "bank" was opened both nobles and workingmen were in the almost endless line of buyers. All who participated in the loan were permitted to view the interior of the machine, while the others could only inspect the outside. Vivid realization of the discomforts as well as the dangers experienced by the tank fighters apparently was an incentive to purchasers.

TRAIN MEETS DISASTER AFTER WILD RUN

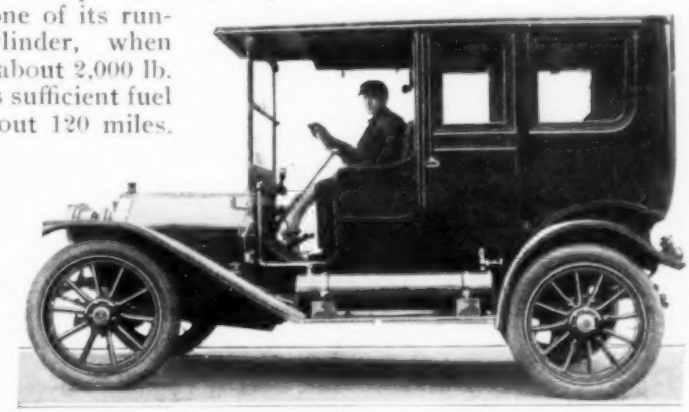
Thrills and hairbreadth escapes rivaling many offered by the movies, marked the events leading to the wreck shown herewith. The striking position of the engine, its nose buried in the mud, aids the imagination in picturing the wild ride down a seven-mile grade in Kentucky, that ended in this disaster. Because of defective air brakes the crew of five men on board were unable to stop the train, composed of 27 freight cars besides the locomotive. All efforts failing, they jumped.



A Striking Photograph of a Train Wreck in Kentucky: The Position of the Engine, Half of Its Wheels in the Air, Powerfully Suggests the Final Swerve That Threw the Rushing Train from the Track

COAL GAS IS MOTOR FUEL FOR AMERICAN CAR

Probably the first motor car in America to use coal gas as fuel is a New York machine that has an 8 by 45-in. steel tank mounted on one of its running boards. The cylinder, when charged to a pressure of about 2,000 lb. to the square inch, carries sufficient fuel to drive the machine about 120 miles. For automobile propulsion, compressed gas at 80 cents a thousand feet is said to be about 25 per cent cheaper than gasoline at 28 cents a gallon. This comparison is based on mileage rather than thermal units. Use of a high-pressure container obviates the inconvenience that the British motorists have experienced in using unwieldy bags that hold only enough fuel for short runs. Concealed installation of the container can be arranged without difficulty.



New York Motor Car That Uses Coal Gas as Fuel: The Cylinder on the Running Board Holds Enough Gas under Pressure to Drive the Machine 120 Miles

USE WASTE TRACING CLOTH FOR SURGICAL SUPPLIES

It has been found that discarded tracing cloth, of which drafting rooms often possess large quantities, is adaptable to making certain surgical supplies, and the American Red Cross is urging that wherever possible this material be collected and used for that purpose. All that is needed is to wash out the coating that makes the linen transparent, and sterilize it. Many power laundries are assisting in collecting and preparing this waste for local Red Cross workers, who make it up into supplies according to prescribed rules.

¶For the purpose of relieving rail congestion on the Pacific coast it is proposed to establish water routes for parcel-post mail, as has been done in the East.

STABLE FOR RACE HORSE RESEMBLES A COTTAGE

The favorite horse of a wealthy owner of racing steeds lives in a stable which, in appearance and furnishings, resembles a small bungalow or cottage. The structure is electrically lighted, steam-heated, and piped for hot and cold water. In summer electric fans keep the flies off the fortunate occupant. The cost of the building was $1,500, fully equipped.

Steam Heat and Other Homelike Improvements are Provided in This Stable for the Fast Horse Shown Here

FANNING MILL FOR SMALL FRUITS AND VEGETABLES

A simple hand-operated fanning mill, designed especially for removing leaves, pods, or dirt from beans, peas, gooseberries, and the like, is provided with a hopper that drops the fruit or vegetables

Convenient Hand-Operated Fanning Mill, in Use and Taken Apart, Which Quickly Separates Leaves, Dirt, or Pods from Small Fruit or Vegetables

across an air vent forming one end of the case inclosing the fan. A vertical screen prevents the produce from striking the fan, but permits it to fall, through an opening in the underside, into a receptacle, while the foreign matter is forced out through the spout.

DEVICE CLOSES WINDOW WHEN IT RAINS

Open windows will close automatically when it rains, if equipped with a

When Rain Strikes the Paper Bar Shown in the Window Latch Above, It Gives Way, Releasing the Sash, as Pictured in the Upper Right-Hand View. At the Right is a Simple Supplementary Weight

simple new device that can be adjusted to any sliding sash. A horizontal rod is attached to a lower corner of the upper sash, on the outside, and fastened to it is a friction lever that can be set to prevent the closing of the window when it is open. This member is held in a locked position by a second lever that rests on a strip of blotting paper, stretched across the horizontal rod. As soon as the paper is dampened by a few raindrops, it loses its strength, permitting the arm to fall and so releasing the friction lever. The window is so weighted that it closes when released.

SPRINKLER PIPES USED FOR HEATING ALSO

By making slight changes in automatic-sprinkler systems in industrial buildings, it has been found that the overhead pipes, originally installed for fire protection, can be used with entire success for heating purposes. Besides being connected with some form of hot-water heater, provision must be made for the circulation of the water. Since automatic-sprinkler heads are so constructed that they open when heated to a few degrees above normal temperature, difficulty was experienced in preventing their operation when the adjoining pipes were filled with hot water. This problem was solved by installing "U" connections in such a way that the hot water does not circulate through them, at the same time keeping the heads cool while the pipes are brought to a much higher temperature.

"INVISIBLE SHIPS" ELUDE THE SUBMARINES

"Invisible ships" are now being used to elude the submarines. Ordinarily they appear like other merchantmen, but in a danger zone they are transformed so that the top line extends straight from bow to stern. This is accomplished by lowering the masts and smokestacks and boarding up intervening spaces. The hulls lie low in the water and are painted a neutral color. When deemed advisable, hard coal is burned, leaving no smoke trail.

Boys in the Plumbing Class: The Fact That These Pupils are Making Parts Which will be Used in a Ship Is a Great Incentive to Accurate Work

TRADE SCHOOL TEACHES SHIPBUILDING

By F. FORREST PEASE

IT is often true that, to understand a man, you must know something of the country from which he comes and the forces which have made him what he is. You cannot appreciate what the Quincy Evening Trade School really is until you know a little about the "industrial giant" that labors in this Massachusetts town and the task for which this giant finds it necessary to train young men.

The Bethlehem Shipbuilding Corporation, at its Fore River plant, employs about 12,000 men, and these men represent nearly 30 different trades and as many different nationalities. So it is plain to see that the labor supply must be varied and enormous.

One of the most serious problems comes from the ever-increasing need for "leading men," or sub-foremen. The wages such men receive would attract adequate numbers from other industries if fit men were available, but obviously, other lines of work do not fit men to be expert shipbuilders. And so it is found necessary to give special training to young men in certain departments of shipbuilding.

In considering the evening trade school it should be clearly borne in mind that it is only a part of the educational work conducted by the Fore River plant, and that a special force of instructors under the direction of the state and city authorities are busy with classes every day.

Now, with the understanding that we have to do with a part and not a whole, let us proceed to deal with the object of this article, the Quincy Evening Trade School. We can, with advantage, consider, first, the purpose; second, the scope; third, the methods, and fourth, the results.

Purpose

The purpose of this school is twofold. Fore River apprentices attend this school to broaden and speed up their training. Helpers and unskilled men attend in order that they may acquire knowledge and skill in some trade. It is a common thing to find men who have been successfully operating some one machine for a period of years but have never learned kindred operations, and therefore lack ability to carry a piece of work through to a

finished product, or to direct others. When such men become familiar with processes which precede and follow the ones with which they are acquainted, they become able to relieve foremen of many details and to direct others on a small scale.

In this connection it should be noted that men who have worked at their trade "outside" find, on entering a shipyard, that there is much to learn, and that nowadays a foreman has little time and patience to act as an instructor. These men find in the evening class very timely help. Briefly stated, the purpose is to help men earn more while building ships.

Scope

Practical use is the measuring stick by which is judged every feature that enters the curriculum of this school. Trade history, unusual theories, duplicate methods are some of the fillers frequently employed to elaborate a program, but which are strictly tabooed here. Every instructor is a practical man, generally a leading man or foreman in his line. He must keep in mind the fact that he is to train young men to work on ships, and that no time is to be lost. Elementary work is characteristic of each class, while it is equally true that advanced students find pertinent instruction. The following classes are conducted: machinist, electricians, plumbers, coppersmiths, sheet-metal, machine-drawing, mold-loft, naval-architecture, and shop-mathematics.

Methods

Individual instruction is the keynote in the methods of tuition. No instructor may have more than 15 students under him at one time. He must not confine his work to lectures or leaflets, but must talk frequently each session with the members of his class and, by constant inquiry, determine the individual needs. The slow learner is not allowed to become discouraged by the more rapid progress of some of his fellows. Nor will a boy with superior previous training and adaptability be held back by the ones who are slow.

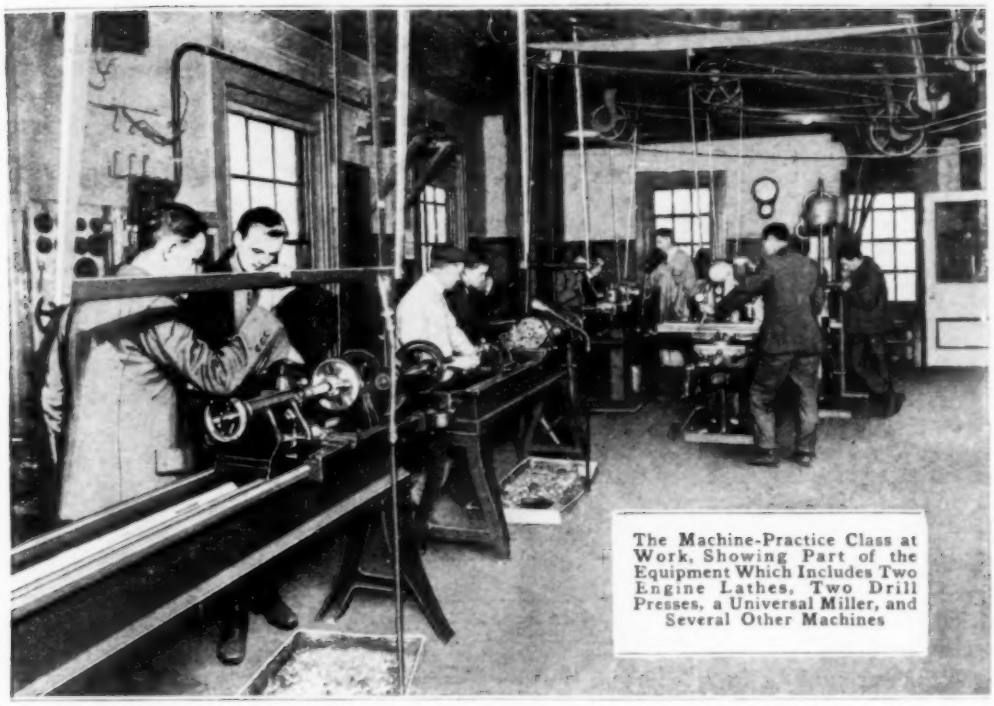
In the machine-practice class, two engine lathes, one screw machine, one universal miller, one key-seating machine, two drill presses, one tool and cutter grinder, one emery wheel, and one large bench with vises, make it possible to do "real jobs." Plans and material are brought from the shipyard and the finished parts are returned. The student must make his work conform to ship standards, and the time he spends on a job is contrasted with what would be allowed under average shop conditions. The fact that a boy is doing a piece of work which is to be used in a ship makes the instruction seem more valuable to him.

In the plumbing, sheet-metal, and coppersmith classes, the students are given standard sketches of marine equipment. They lay out on the floor full-sized plans, and then, with the proper material, fashion the part required. Some very creditable tees, ells, offsets, etc., have been made, although no fittings have been supplied the yard. That remains for the future and will be attained.

In the mold-loft class, they take drawings of ships that have been built, and on large tables with big sheets of paper lay out after the fashion of a mold loft. This year a special feature is adding interest and enthusiasm to the work. A group of advanced students are developing the full data and molds complete for a model ship, 20 ft. long. The plans of a famous ship, built at Fore River a few years ago, are being used, and the actual building of the model is to be done by other classes. These boys are thinking and thinking hard.

In the drawing class boys are learning to read just such blueprints as they will encounter in the shops. They sketch parts taken from assembly drawings and assemble on paper the parts given them on sketch sheets. The work is conducted by a chief draftsman and his assistant, and again it is a case of personal effort with each student.

The shop-mathematics class is successful because the instructor is earnest, resourceful, and sympathetic. It is a difficult class to teach because the boys vary so in their previous training.



The Machine-Practice Class at Work, Showing Part of the Equipment Which Includes Two Engine Lathes, Two Drill Presses, a Universal Miller, and Several Other Machines

One lad must first learn how to add fractions; the next wants to study algebra; another wants help with his geometry, while a fourth will blandly inquire if he can have a little coaching on calculus.

In every case the instructor inquires into the nature of the work and plans of the student and then gives lessons accordingly.

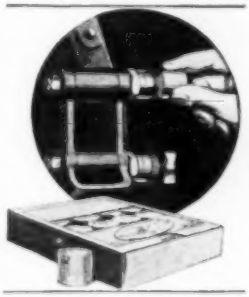
In the naval-architecture class the men study the elementary principles of naval construction and learn the terms employed. Many of them are college-trained men, and the others have a good general education. They demand practical instruction that will be a direct benefit to them in the work they are doing.

Results

With such intensive methods it is not surprising to find that the boys who attend these evening classes are the ones most often found fit for promotion on the job. This is true, and the school is recognized as a valuable agent in producing trained men for the shipyard. Over 500 applications were received before the present term began, and the 260 accepted filled the accommodation afforded to overflowing. Overtime work has cut down average attendance, but the spirit is there, and the good work goes on.

CAPSULES HOLD LUBRICANT USED IN NEW GREASE CUP

Paper capsules filled with grease are used in a new lubricating cup that is particularly intended for motor cars. Convenience and elimination of waste are the two outstanding advantages of the device. By turning a thumbscrew, the plunger forces the lubricant into the bearings. The empty capsule is withdrawn by the plunger when the cover is removed from the cap for the insertion of a fresh capsule.



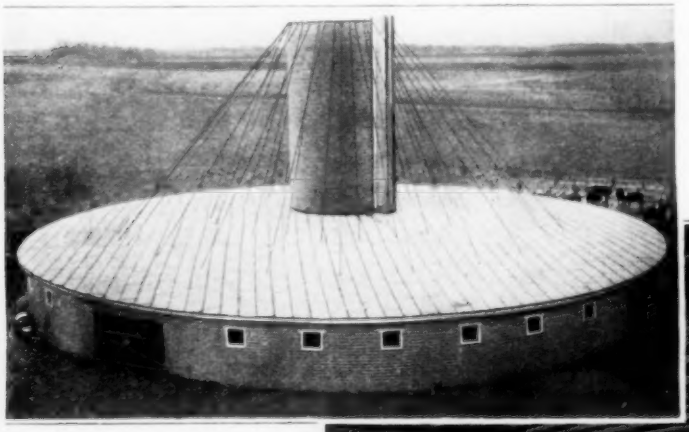
HOTEL PATRONS EAT BELOW SEA LEVEL, SLEEP ABOVE

The distinction of having the only hotel in which patrons may sleep above sea level and dine below it is claimed by El Centro, Calif. The city has grown up in the midst of a desert because of the success of numerous irrigation projects near by. The surface of the valley in which the city is built is at that point 52 ft. below sea level. The hotel is four stories high, hence guests on the fourth floor are above sea level. The dining room is on the first floor. The hotel and other buildings of the down-town district also have an odd feature in being constructed to form permanent canopies over the sidewalks. These serve to protect pedestrians and particularly "window shoppers" from the scorching desert sun.

The Hotel At El Centro, California, Is Partly above and Partly below Sea Level

UMBRELLALIKE SHELTER FOR BIG HERDS

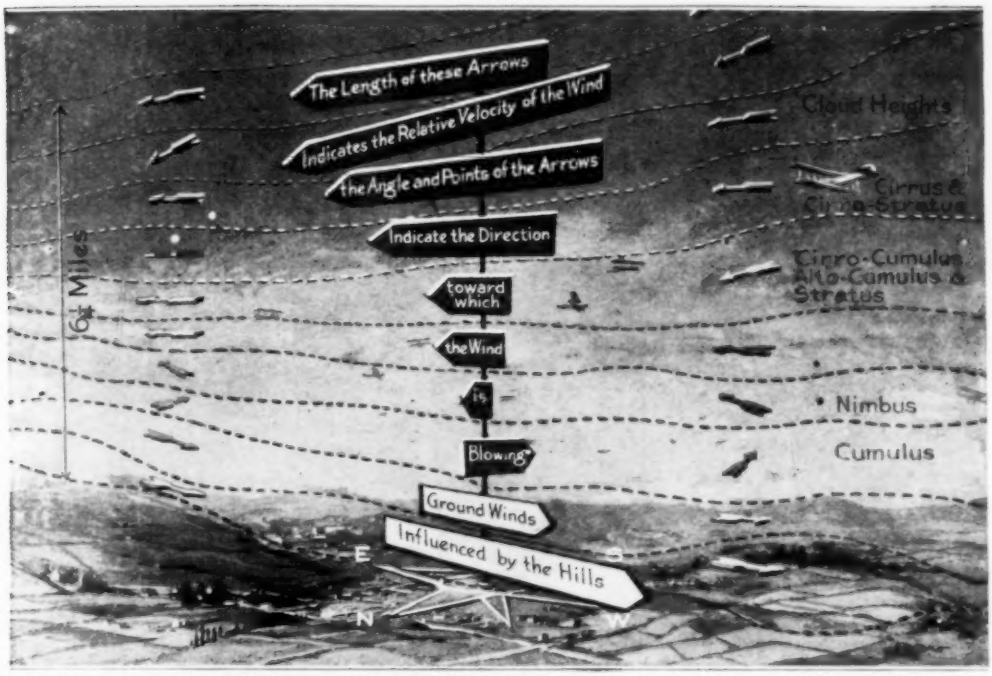
Conventional designs for farm buildings were wholly disregarded by the owner of a large stock farm when he recently erected an umbrellalike shed in which to house 300 cattle and 200 hogs. The circular shelter is 122 ft. in diameter and about 380 ft. in circumference, and at its center rises a clay-block silo, 60 ft. high. The advantage of having feed stored at the center of such a shelter is easily seen. There are no supports beneath the almost flat roof other than the 12-ft. outer wall and uprights adjacent to the silo.



Shed 380 Feet in Circumference, with a Silo in the Center, in Which 300 Cattle and 200 Hogs are Housed

COURTESY OF POWER FARMING

Interior View Showing the Area Unobstructed by Supports and the Encircling Purlins on Which the Rafters Rest



FROM THE SPHERE, LONDON, COPYRIGHT IN THE UNITED STATES BY THE NEW YORK HERALD CO.

Arrows Showing the Direction and Velocity of Wind Currents to a Height of Six and One-Fourth Miles: These Data were obtained in a Single Ascent by a Pilot Balloon Equipped with Recording Instruments

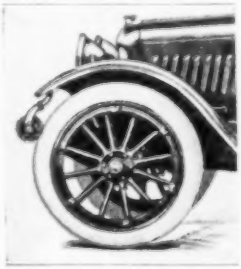
silo. The radiating rafters are laid on two encircling sets of purlins which are in turn suspended from wire cables that extend to the top of the silo. The inclosed area is so spacious that a load of hay can be driven into the shelter and turned around without difficulty. The roof is high enough, also, to allow the accumulation of manure and bedding throughout the winter, the plan being to remove it all at one time in the spring.

DIAGRAM OF AIR CURRENTS SHOWS FLIERS' PROBLEM

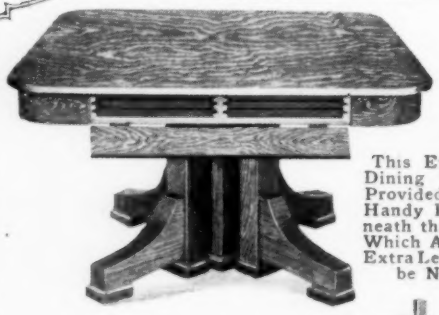
Data about the numerous currents and layers of air above the earth, of as much interest to the layman as it is of practical value to the airman, has recently been compiled by scientists after conducting a large number of experiments with pilot balloons, fitted with instruments that registered conditions every 3,280 ft. A typical set of readings taken in one of these balloons is illustrated herewith, showing the different air currents found in an ascent of six and one-fourth miles. The various directions in which these currents were traveling, and their speeds, give an excellent idea of the perplexing atmospheric conditions with which fliers must cope.

SMALL BRUSH ACCESSORY KEEPS TIRES CLEAN

Brushes mounted on the mudguards of a motor car or other vehicle, to remove grit from the treads, have been developed as a means of increasing tire mileage. The brushes rest lightly against the tires and as the wheels revolve brush off grit and other material causing wear, if allowed to adhere to the treads.



FURNITURE FOR VARIOUS ROOMS IN THE HOME



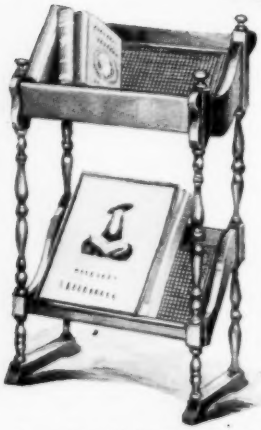
This Extension Dining Table is Provided with a Handy Place beneath the Top in Which All of the Extra Leaves may be Nested

An Ornamental Telephone Cabinet: Closed, There Is Nothing to Suggest a Telephone. A Potted Plant or Lamp may be Kept on Top and the Stool Placed Underneath When It Is Not in Use

With the Leaves Drawn Up, This Oak Smoking Stand, at the Right, Serves Also as a Card Table

No Veranda Space need be Occupied by a Bed in the Daytime Where the Article of Porch Furniture, Pictured Above and Below, is Used. After Swinging Back the Upholstered Cushions, the Mattress and Springs are Unfolded as Indicated. The Woodwork is Waterproofed, and the Cretonne Coverings may be Changed as Desired

The Attractive Tea Wagon Shown Below Has a Removable Tray and Hinged Leaves That can be Drawn Up to Make a Circular Top. There Is a Drawer for Silverware



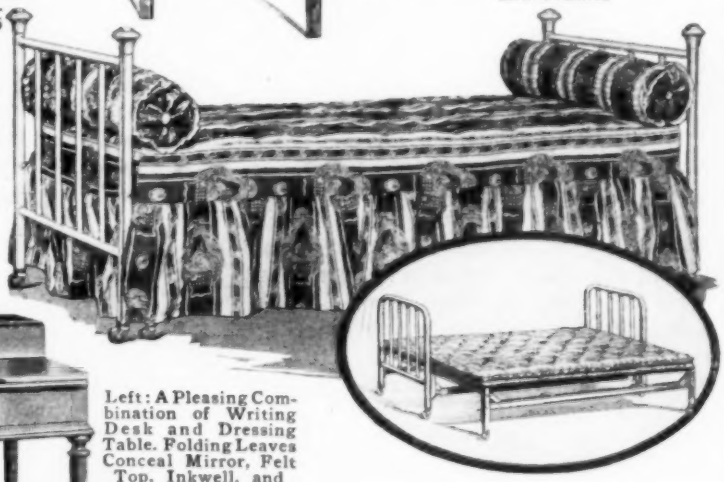
Cane Panels in the Slanting Shelves Add Much to the Appearance of This Book and Magazine Rack

DESIGNED ESPECIALLY TO MEET MODERN NEEDS

Convenient Cabinet for a Moderately Priced Phonograph: The Special, Tilting Drawers Hold 25 Records Each

A Dainty Mahogany Shoe Case, Containing Compartments for Footwear, Polish, and Brushes

The Convertible Day Bed, at the Right, is Well Suited for a Living Room. At Night the Sliding Section can be Drawn Out and Covered by Unfolding the Mattress, as Shown in the Oval



Left: A Pleasing Combination of Writing Desk and Dressing Table. Folding Leaves Conceal Mirror, Felt Top, Inkwell, and Drawers

This Table with a Bookshelf Serves Also as a Desk, the Drawer Having a Lid in Which Is an Inkwell

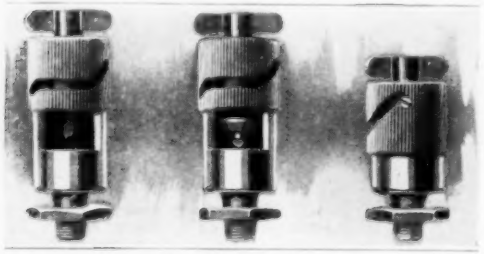
Drills Mounted on a Float, Employed in Making Blasting Holes in the Rocky Bottom of the Genesee River: Freshets Frequently Drove the Men from Their Work Before This Expedient was Used

MOUNT DRILLS ON FLOATS TO AVOID FRESHETS

The frequent rise of the Genesee River has forced engineers engaged in removing rocks from the bed of that stream, at Rochester, N. Y., to install their drills on a float so that their preparations for blasting will not be disturbed by the freshets. The float is moored so securely that the drilling can be done accurately, even in deep water. As fast as the holes are made in the sandstone they are filled with blasting powder and the float is removed to the next location. When all is in readiness the blast is touched off.

QUICK-FILLING GREASE CUP WITH FIXED CAP

For motor vehicles and other machinery a side-filling grease cup with a nonremovable cap has been devised. A half turn opens it so that lubricant can be introduced with a gun or tube. It has a cam action and no threads to cross or jam. When open, it holds enough grease for two applications. The act of closing it—a half turn—forces a normal cupful of grease into the bearing and leaves an equal amount to be injected by the plunger as required.



At the Left the Side-Filling Grease Cup is Shown, Ready for Filling; in the Middle, Open with Its Plunger in View, and at the Right, Closed

DECIMAL-POINT FINDER AIDS ENGINEERS

In making calculations with the aid of one or more slide rules, it is necessary for the user to keep mental account of the place of the decimal point at each operation of multiplication or division and until the final result is obtained. In case of possible error the whole calculation has to be gone over again. To avoid this tax on the mind an engineer has invented a device which by a series of manipulations fixes the place of the decimal point, in advance. It consists of a small disk and cover on which markings and graduations are printed. A sharp stylus is provided for moving the disk.

In this operation, the disk is revolved beneath the cover according to stated rules, the application of which is determined by the factors in the problem in hand.

NEW BRONZE FOUND TO HAVE REMARKABLE PROPERTIES

Because of the unusual properties it possesses, a new copper-aluminum alloy can be tempered to the hardness of steel and, as shown by recent railway tests, used successfully for bearings in place of bronze containing tin. Although copper is its chief ingredient, the material has high resistance to acids and is not affected by salt water. It can be cast, spun, drawn, brazed, and even soldered with silver. Another interesting point is that some of it takes on a gold hue that permits its use for jewelry purposes. Drawn to a wire of .008-in. diameter, it has shown a tensile strength of 132,000 lb. to the square inch. In other forms it has tested to figures less than this, but over 100,000 pounds.

RAILWAY FIREMAN KNITS FOR THE SOLDIERS

A patriotic fireman on the Chicago, Burlington, and Quincy Railroad is of the opinion that knitting is just as appropriate a service for men as for women. Consequently he carries knitting needles and yarn with him in his engine cab and in his spare moments has made articles for several soldier friends.

A Patriotic Locomotive Fireman Who Sees No Reason Why Women should Have a Monopoly on Knitting as a Spare-Time Occupation

AMERICAN WOMAN OPERATES MOBILE KITCHEN AT FRONT

Several American women of prominence are the donors and supporters of motor kitchens at the front in France. One of them, at least, is also the presiding angel of her car—which bears the insignia of the Y. M. C. A.—and accompanies it even when it goes well within the range of the enemy's guns. Over its counters she passes warm drinks and sandwiches to scores of boys daily.

The Motor Kitchen Is a Popular Congregating Place, and Chats with Its Presiding Angel and Her Assistant are as Enjoyable as the Refreshments That are Waiting for the Hungry Soldier

LETTUCE GROWN IN WINTER UNDER GLASS BELLS

One of the most striking features in connection with England's war-time emphasis on intensive agriculture is a

COPYRIGHT UNDERWOOD & UNDERWOOD

A Winter Crop of 250,000 Heads of Lettuce Growing in England under Glass Bells: A Striking Aspect of British Effort to Get the Most Out of Its Farm Land

field in the southern part of the island on which are being grown, during the winter months, 250,000 heads of lettuce under big glass bells. These transparent protectors make it possible, in England's mild climate, to utilize land at a time when it would otherwise lie idle. As the accompanying photograph shows, the cultivating is being done by women.

MORTARLIKE GUN IS USED AGAINST HIDING U-BOATS

Merchant ships and other vessels are being equipped with a new high-trajectory gun that has been designed particularly for use against submerged submarines. It is built on the mortar principle and hurls a projectile at a great angle of elevation so that when approaching the target it falls almost perpendicularly. Because of this it is not deflected by the water, but sinks like a depth bomb. It explodes with terrific force.

FAIR REST ROOM BECOMES NOVEL AD CENTER

A southern business man recently decorated a rest room on the local fairgrounds in an original manner, at the same time earning the privilege of advertising his own business on the walls of that popular meeting place. Some time before the fair opened he addressed letters to railroads, chambers of commerce, and leading manufacturers, as well as consuls in all parts of the world, inviting them to contribute photographs to a so-called "round-the-world" rest room on the fairgrounds. In response to this appeal the writer obtained over 1,000 interesting photographs, large and small, with which he decorated the walls of the room in question. Having obtained the pictures, which of course served as advertising for the senders, the originator of the plan was allowed space for a business notice of his own.

COMBINED SCALE SHEATH AND CLEANER

An improved sheath for a mechanic's metal scale is provided with two flaps at its opening to which oiled pads are fastened. In removing or replacing the scale these pads may be pressed against the metal with the thumb and finger, thereby rubbing off the dirt and giving the scale an oil coating that prevents rust such as is caused by handling while the fingers are moist with perspiration. The sheath occupies little space in the pocket.

Two Pure-Bred Karakul Lambs on a Kansas Ranch: The Foresight of an American Who Dared to Spend Over $35,000 in the Venture has Brought to America Sheep of This Valuable Breed, Thus Making Possible the Raising of Animals Yielding Fur That Formerly had to be Imported

SHEEP TO KEEP AMERICANS IN FUR

By ROBERT H. MOULTON

IN far-away Bokhara, a town and district in Asiatic Russia that has a half-mystical sound to American ears, "Persian" lambs have been grown for ages for the tightly curled, lustrous-black fleeces that constitute the warm covering of the natives. See the fierce Cossacks as they ride by! Summer or winter their headgear is the same, a turbanlike cap of Persian lamb. In Persia the furs and textures from fair Bokhara are highly esteemed.

And so the fashion of wearing Persian lamb and astrakhan has come down from the ages until women in all civilized lands where the winters are cold, and many men, also, seek the warmth that is found in the black fleeces from Bokhara. Fashion's decree has made them so popular that the cost of Persian lamb has gone up 142 per cent in 15 years.

A Prize for a Furrier: Pelt of a Half-Blood Karakul-Lincoln Lamb

It must have been instinct—it could not have been foreknowledge that a world war would curtail commerce—that made an American decide a few years ago to try breeding the sort of sheep that bear the highly prized fleeces, on his 1,900-acre ranch near Cottonwood Falls, Kan. He reasoned that if they could be bred in Asia, they could be bred in Kansas, and so thoroughly did he believe in the proposition that he invested $35,000 in karakul sheep from Bokhara. He bought 19 rams and 15 ewes. These he crossed with native Lincoln-bred sheep, and the lambs of this cross bear the valuable pelts that hitherto have been imported almost exclusively from Russia.

In addition to his pure-breds he now

LETTUCE GROWN IN WINTER UNDER GLASS BELLS

One of the most striking features in connection with England's war-time emphasis on intensive agriculture is a field in the southern part of the island on which are being grown, during the winter months, 250,000 heads of lettuce under big glass bells. These transparent protectors make it possible, in England's mild climate, to utilize land at a time when it would otherwise lie idle. As the accompanying photograph shows, the cultivating is being done by women.

COPYRIGHT UNDERWOOD & UNDERWOOD

A Winter Crop of 250,000 Heads of Lettuce Growing in England under Glass Bells: A Striking Aspect of British Effort to Get the Most Out of Its Farm Land

MORTARLIKE GUN IS USED AGAINST HIDING U-BOATS

Merchant ships and other vessels are being equipped with a new high-trajectory gun that has been designed particularly for use against submerged submarines. It is built on the mortar principle and hurls a projectile at a great angle of elevation so that when approaching the target it falls almost perpendicularly. Because of this it is not deflected by the water, but sinks like a depth bomb. It explodes with terrific force.

FAIR REST ROOM BECOMES NOVEL AD CENTER

A southern business man recently decorated a rest room on the local fairgrounds in an original manner, at the same time earning the privilege of advertising his own business on the walls of that popular meeting place. Some time before the fair opened he addressed letters to railroads, chambers of commerce, and leading manufacturers, as well as consuls in all parts of the world, inviting them to contribute photographs to a so-called "round-the-world" rest room on the fairgrounds. In response to this appeal the writer obtained over 1,000 interesting photographs, large and small, with which he decorated the walls of the room in question. Having obtained the pictures, which of course served as advertising for the senders, the originator of the plan was allowed space for a business notice of his own.

COMBINED SCALE SHEATH AND CLEANER

An improved sheath for a mechanic's metal scale is provided with two flaps at its opening to which oiled pads are fastened. In removing or replacing the scale these pads may be pressed against the metal with the thumb and finger, thereby rubbing off the dirt and giving the scale an oil coating that prevents rust such as is caused by handling while the fingers are moist with perspiration. The sheath occupies little space in the pocket.

Two Pure-Bred Karakul Lambs on a Kansas Ranch: The Foresight of an American Who Dared to Spend Over $35,000 in the Venture has Brought to America Sheep of This Valuable Breed, Thus Making Possible the Raising of Animals Yielding Fur That Formerly had to be Imported

SHEEP TO KEEP AMERICANS IN FUR

By ROBERT H. MOULTON

IN far-away Bokhara, a town and district in Asiatic Russia that has a half-mystical sound to American ears, "Persian" lambs have been grown for ages for the tightly curled, lustrous-black fleeces that constitute the warm covering of the natives. See the fierce Cossacks as they ride by! Summer or winter their headgear is the same, a turbanlike cap of Persian lamb. In Persia the furs and textures from fair Bokhara are highly esteemed.

And so the fashion of wearing Persian lamb and astrakhan has come down from the ages until women in all civilized lands where the winters are cold, and many men, also, seek the warmth that is found in the black fleeces from Bokhara. Fashion's decree has made them so popular that the cost of Persian lamb has gone up 142 per cent in 15 years.

A Prize for a Furrier: Pelt of a Half-Blood Karakul-Lincoln Lamb

It must have been instinct—it could not have been foreknowledge that a world war would curtail commerce—that made an American decide a few years ago to try breeding the sort of sheep that bear the highly prized fleeces, on his 1,900-acre ranch near Cottonwood Falls, Kan. He reasoned that if they could be bred in Asia, they could be bred in Kansas, and so thoroughly did he believe in the proposition that he invested $35,000 in karakul sheep from Bokhara. He bought 19 rams and 15 ewes. These he crossed with native Lincoln-bred sheep, and the lambs of this cross bear the valuable pelts that hitherto have been imported almost exclusively from Russia.

In addition to his pure-breds he now

has more than 100 mature half-blood karakul-Lincolns from last year's breeding. The pure-bred and half-

A Pure-Bred Karakul Ram: One of the Animals Used in Introducing the New Stock into America

blood rams are now being crossed with 900 white Lincoln and Cotswold ewes. The lambs of this cross bear the valuable pelts. Lambs that are black are the most prized, because they are the Persian lambs, whose lustrous-black fleeces often bring such a big price. When they are larger and less tightly curled, they are called astrakhan. If the fur shows shades of gray, it is called "Krimmer."

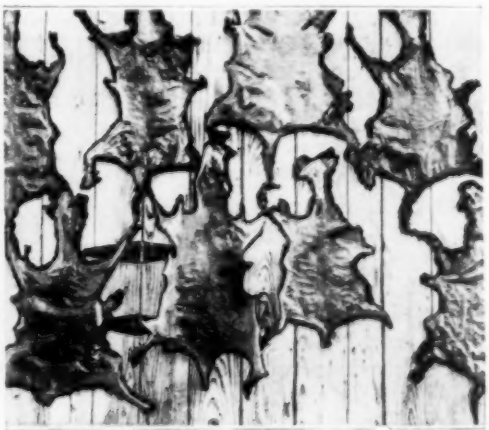
Six hundred curly, lustrous-black lambs were born on the Kansas ranch last spring. Their parents were sheep from two continents—black karakul rams from Asia and white Lincoln and Cotswold ewes of America.

New York furriers, who gladly bought the pelts produced in Kansas, have stated that with the proper skinning they would have equaled pelts of the same fur grown in Asia. From $3 to $10 apiece were the prices received by the ranchman, while a few choice pelts, properly skinned, brought $15 apiece.

This Kansan is, so far, the only man who has bred karakul sheep outside the Russian empire. So great is the promise in the undertaking, as shown by results obtained last spring, that the Kansas College of Agriculture, which has had an expert assigned to the test to give aid in an advisory way, has asked and received permission to assist in perfecting the new fur farming. And now that the war has given the needed protection, the matter will be pushed most vigorously and along scientific lines.

The initial effort under the coöperative plan, was the dispatching of an experienced experimental breeder to Bokhara, to study karakul fur farming in its native country. This man encountered difficulties in penetrating to the heart of Asia, chiefly from the fact that the fur growers of Bokhara, who already had heard of the successful pioneer work in fur farming in America, were doing all in their power to prevent the exportation of karakul sheep from their province. The Kansas expert, however, succeeded in entering the Russian fur region, carrying a passport from the Department of State and credentials from the secretary of agriculture, which could not be ignored by the Russian authorities.

When the ranchman invested $35,000 in the first importation of karakul sheep —34 head—and converted his $40,000 ranch into a farm for fur production, the undertaking appeared more like a gamble than a sane project. Only the scientific fact that the karakul rams crossed with native American long-wool ewes would give fur-bearing lambs, backed him. No one ever had demonstrated the production of these furs for commercial purposes in the United States, but that fact seemed sufficient, and there wasn't any doubt of



Lamb Skins Stretched Out to Dry: From the Ranch on Which Are the Only Karakul Sheep Bred Outside of Russia

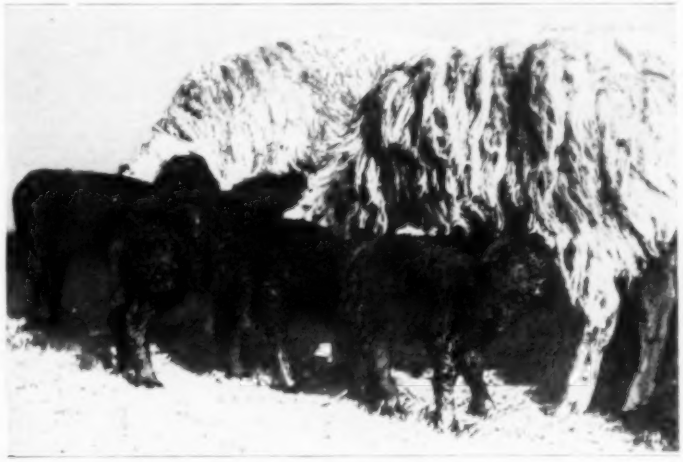
the sheep thriving in this country, inasmuch as they are a hardier breed than native sheep.

Three hundred karakul-Lincoln and karakul-Cotswold lambs came in the first crop. One hundred were marketed for fur and the rest kept for breeding animals. The average price received for the skins was between $5 and $6. The skins were only a few days old. Pelts from lambs born dead or from lambs that die soon after birth bring just as good prices as the others.

The second year's lamb crop—that of last spring—besides being twice as large, revealed some of the most important facts yet learned in the experiment. It was proved for the first time that the half-karakul rams, when crossed with the Lincoln and Cotswold ewes, bred lambs whose pelts were almost as valuable as those of the half-blood lambs. Of the 150 lambs thus bred, 142 were solid black. Only five were white and three spotted. The fact that such a large predominance of black quarter-bloods can be depended upon from this cross, and that their skins apparently were as valuable as the half-blood pelts, are most gratifying when it is known that the half-karakul rams are worth $100 to $150 apiece while the pure-bred karakuls sell for $1,000 to $1,200.

The success of the enterprise and the support the agricultural college is giving it have caused a popular demand for the breeding animals. Twelve of the pure-bred karakuls were reared last year. A number of offers for these were refused because the owner desired to keep them to build up his own pure-bred herd. He did sell two of them for $1,000 apiece, and four of the 200 half-bloods for $100 apiece. The value of the season's result, in figures, was:

Half-blood pelts, 100 at $5 (average)	$ 500
12 pure-bred karakuls at $1,000	12,000
200 half-bloods at $100	20,000
From sale of wool	1,200
Total	$33,700

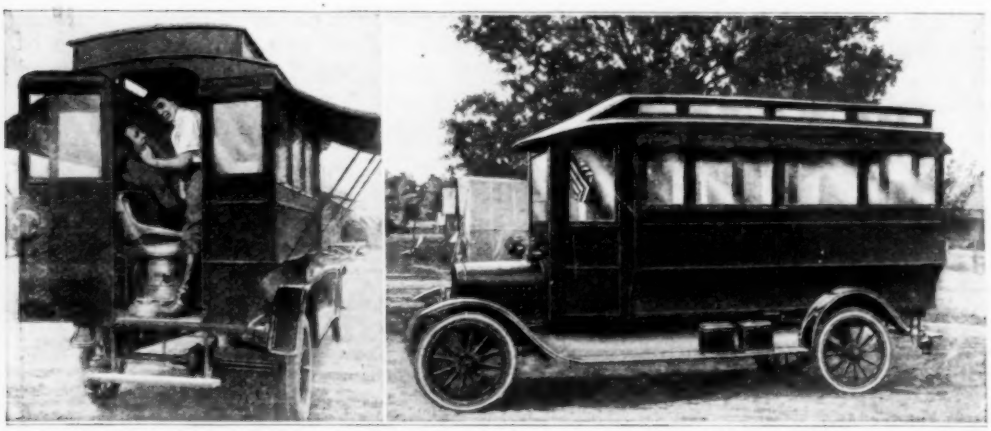


White Lincoln and Cotswold Ewes and Some of Their Black Fur-Bearing Lambs Produced by Breeding to Pure-Bred and Half-Blood Karakul Rams

Another valuable characteristic of the karakul sheep was learned when a shipment of half-blood stock was made to a packing house at Fort Worth, Texas. Letters from the general manager testify to the superior mutton qualities of his breed. He said the cross seemed absolutely to breed out the "sheepy" taste common to the meat of native sheep.

DENTIST'S AUTO AMBULANCE AIDS ARMY EFFICIENCY

To the list of especially equipped auto trucks used in our army may now be added the dental ambulance—a light auto truck with a body having windows on all sides and containing an operating room, measuring 5 by 8 ft. With this outfit an army dentist can begin work at any point along a line of march, with scarcely a moment's delay. The car is equipped with a regulation dental chair and an electric motor deriving its power from storage batteries. The latter are charged by a special generator attached to the fan. Near the front end of the compartment, at either side, are closets



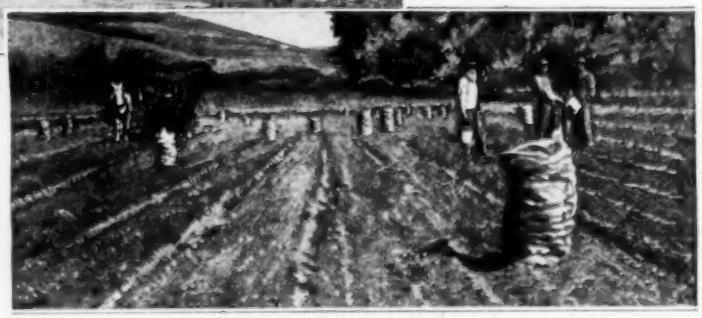
At the Left Is a Soldier Having His Teeth Treated in Our Army's New Dental Ambulance. The Car, as the Right-Hand Picture Shows, is Well Lighted on All Sides; Its Equipment Is Similar to That of a Regular Dentist's Office

and drawers in which materials and instruments are kept. Just back of the driver's seat is a wardrobe with a mirror door, and on the right is a bench for doing laboratory work. Extra supplies are kept in large compartments beneath this bench. At the front end of the car, out of the dentist's way, provision is made for a clerk or assistant. Ventilators are provided in the roof of the car.

BIG CROPS ARE OBTAINED ON CITY LAND IN UTAH

As interesting as the accompanying photographs, taken in Salt Lake City's municipal "war gardens," are the figures showing the total amount of produce raised on those lands during the past season. The record is as follows: Approximately 1,200 bu. of potatoes, 150 tons of hay, 500 bu. of wheat, 2,000 bu. of oats, 45 tons of carrots, and 18 tons of straw. The total value of the crop was more than $10,000. The fact that Salt Lake City is already planning to place under cultivation 1,200 more acres for 1918 than it had last year, should serve as a timely suggestion for cities with tracts of untilled land.

Threshing Wheat Raised on Salt Lake City's Municipal Land: The Crop Was Worth $1,050



Part of a Yield of 1,200 Bushels of Potatoes in Salt Lake City's Municipal "War Gardens"

CITY'S ONE BIG CAMPAIGN AIDS ALL WAR CAUSES

MORE striking and significant, in many respects, than any of the special campaigns that have been held in large cities for the Red Cross, the Y. M. C. A., and so on, is the all-inclusive campaign that recently closed in the city of Rome, N. Y. Not one but all war benevolences were included in the effort. The pledges were taken not merely for the present but, at so much per annum, for the duration of the war. While this idea did not originate in Rome that city has perhaps worked it out more extensively than any other, and its gifts, averaging $15 per capita, are far in excess of those made in most communities whose per-capita wealth exceeds that of Rome. So successful was the "War Chest" campaign, as it was called, that several near-by cities, including Utica, Little Falls, Herkimer, and Auburn, have asked this city's aid in similar efforts. The outstanding fact that has impressed these neighboring towns is that Rome, a manufacturing city of 22,000 population, has been able to secure pledges for $346,000 per year, for the period of the war.

This big fund is being administered by a central body composed of men well known locally, in whom the community has entire confidence. From it contributions are made, as occasion arises, to families rendered needy by the war, to the Red Cross, Y. M. C. A., Y. W. C. A., Knights of Columbus, Salvation Army, etc. The promoters point out that the War Chest plan prevents repeated solicitations and consequently effects a big saving of time and money. It serves also as a sure check on war "benefits" of a questionable or dishonest sort, such as were held in England and elsewhere earlier in the war. Appeals for support are now made to the War Chest Association, and its executive body, composed of 16 men, judge the merits of the requests, so that every man in Rome feels that his money is being expended wisely.

The care with which numerous phases of the campaign were worked out in advance contributed largely to its success. For 10 days previous to the "drive" full-page advertisements appeared in the local daily paper, together with well-drawn cartoons and human-interest articles. Posters similar to those used by the Red Cross were displayed, and the churches and schools assisted enthusiastically in the advertising.

The soliciting was in charge of a campaign manager who appointed two men designated as generals. These two selected nine captains each, and each captain chose 10 associates. Annual dues for membership in the association were placed at $12, and a bronze button was provided for each member. It was expected that only those whose income was $1,200 or less per year, would limit their contributions to the bare membership fee. A table was prepared which suggested that persons having incomes of $1,500 per year give $18 per year; those earning $2,000, $24, and so on. For incomes of $10,000 or more a 10-per-cent contribution was suggested. Corporations were asked to make three per cent of their 1917 income the basis of their yearly donations. The campaign lasted a week, the workers holding a luncheon daily at which reports were made and plans laid for the soliciting that remained.

The important task of informing and interesting the 6,000 factory employes was placed in charge of a special committee which soon created a friendly rivalry between the various plants and different departments in the same plants. Meetings were held in each establishment, according to a carefully arranged schedule, at which local men, assisted by four Canadian soldiers, made stirring appeals.

A bulletin board was set up in each factory, on which all the plants were listed. Each day the percentage of employes in each establishment that had joined the association was entered on these boards. A similar board, measuring 26 by 30 ft., was erected on a principal business corner in the city. The general committee also provided the larger factories with departmental charts showing percentages in a sim-

ilar manner—a very effective means of arousing support. Each factory department was divided into groups of about 10 men each, and one man in each was appointed to solicit his associates. Out of a total of 5,984 workers, 5,731 subscribed.

The War Chest campaign did much more than raise a splendid sum for war causes. It developed a unified, patriotic spirit in the city. Factory hands and factory superintendents came to see more clearly the country's need for efficient production. The sacrifice in which all the citizens participated brought all classes into closer sympathy with each other and united them unselfishly in the fight for democracy.

FOOD MACHINE IS PROMOTER OF KITCHEN EFFICIENCY

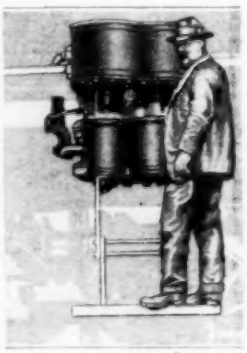
For small-restaurant and large-residence kitchens a medium-capacity model of a highly developed electric food-preparing machine has been introduced. Its bowls are of four and ten-quart capacities, while its appliances include the various devices for mixing, mashing, grinding, grating, slicing, shredding, sifting, straining, whipping, and beating operations. By eliminating about a third of the manual work associated with food preparation, it promotes efficiency and cleanliness in addition to conserving materials.

RARE METAL IS DISCOVERED IN JOPLIN ZINC BLENDE

According to reports, gallium, a rare metallic element, has been found in the zinc blende from the Joplin, Missouri, district and is being recovered and sold for about $240 an ounce. The discovery was made accidentally by a watchman who observed silverlike globules on some lead residue and was sufficiently curious to call the matter to the attention of a chemist. In some particulars gallium resembles aluminum. It is remarkable for its low boiling point, which is 86° F., and was predicted long before its discovery in 1875 by Mendelyeev, who took the periodic law as a basis for his assumption and called the metal eka-aluminum. Several strange characteristics are possessed by the metal, one of them being that it almost instantly forms a mirror-like film over glass if brought into contact with it, and reassembles in the form of a globule when a few drops of weak sulphuric acid are introduced.

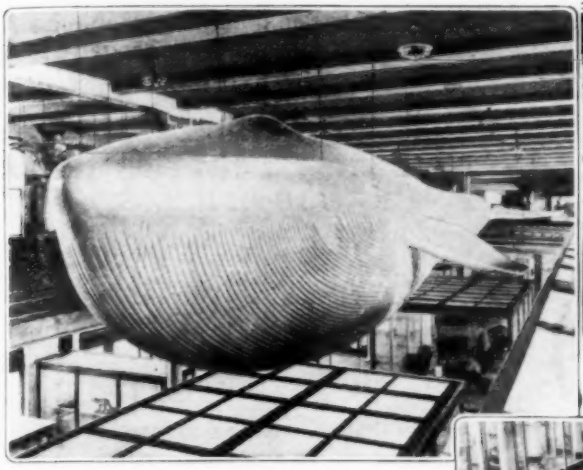
FOLDING STEP HELPS ENGINE RUNNER OIL AIR PUMP

In the interest of safety, a step that enables an engine runner to stand erect in front of the air pump of his locomotive, when oiling and inspecting it, has been adopted by the Missouri, Kansas and Texas Railway. The device removes the necessity of a man kneeling on the running board and leaning far over to see and reach the parts that require attention. The hanger is hinged at the middle so that the step may be turned out of the way when idle.

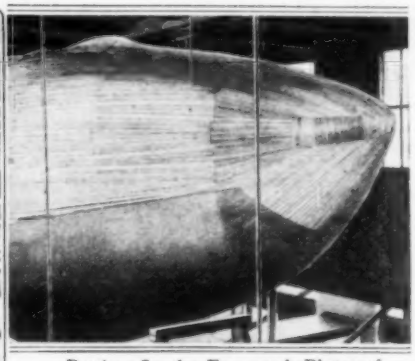


¶The American army, like the British army, now has its own military police in Paris and other military centers in France. These officers wear the regulation military uniform with a black sleeve badge on which are the letters M. P. in red.

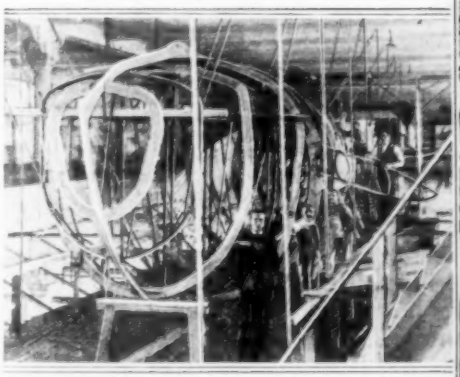
REPLICA OF GIANT WHALE BUILT FOR MUSEUM

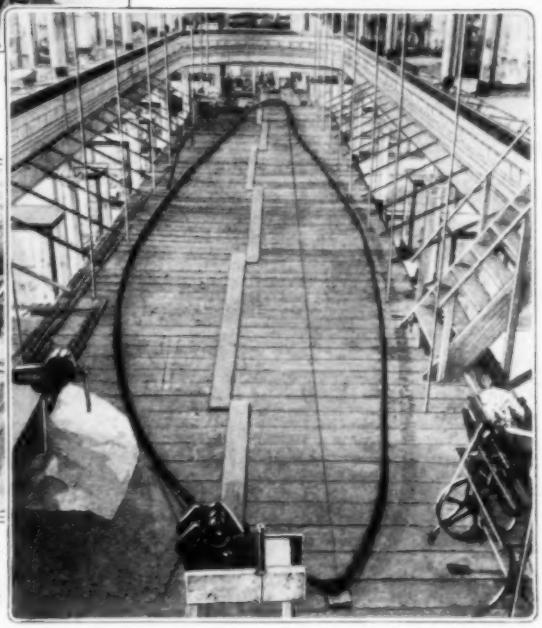


The Completed Model of the 76-Foot Sulphur-Bottom Whale as It Now Appears at the Museum



Boxing-In the Frame: A Phase of the Work That Recalls Canvas-Canoe Construction





The Model was Built in the Elevated Position It Now Occupies. This Shows the Frame Well in Hand. Right: Laying Out the "Double Keelson", the First Step in the Actual Construction of the Big Aquatic Mammal

At the American Museum of Natural History, New York, a life-sized model of a sulphur-bottom whale has lately been made from measurements and photographs of a 76-ft. specimen obtained some time ago. The replica is particularly interesting because of the excellence of its workmanship. It is built of papier-mâché over a steel and wood framework. The peculiar folds of the throat and forepart of the body were formed by long strips of wood carefully cut and bent. In all about eight months were spent in completing the task, which had many difficult phases, all of which, however, were successfully surmounted.

BRICK BUILDING BATTERED DOWN BY RAMPANT CAR

Destruction similar to that of an aerial bomb was accomplished with completeness by a street car at Holyoke, Massachusetts, some weeks ago when it went on a rampage and hurled itself against one corner of a four-story brick building. The impact was sufficient to break the

supports and cause the front wall to crash to the street, leaving the interior of the structure exposed. The car was

A Piano and Hundreds of Bricks Crashed through the Roof of the Car, Burying Several of the Passengers

crushed and nearly buried in the avalanche of débris, and most of the 20 persons aboard it were injured.

ONE-MAN PIANO LOADER FOR LIGHT TRUCK

Loading an upright piano onto an auto truck, and unloading it, has been made a comparatively easy task for one man, by the invention of apparatus that attaches to the rear of a light truck of well-known make. The device, while in an upright position, is securely clamped to a pivoted frame, after which, by operating a windlass, the frame and piano are brought into a horizontal position and drawn onto the rear of the truck.

Left: Turning the Windlass Which Swings the Pivoted Frame and the Piano Up onto the Rear of the Truck. Right: Mounted and Covered in This Way, a Piano can be Delivered in the City or Country by One Man without Assistance

OCTOBER EXPORTS REACHED NEW HIGH RECORD

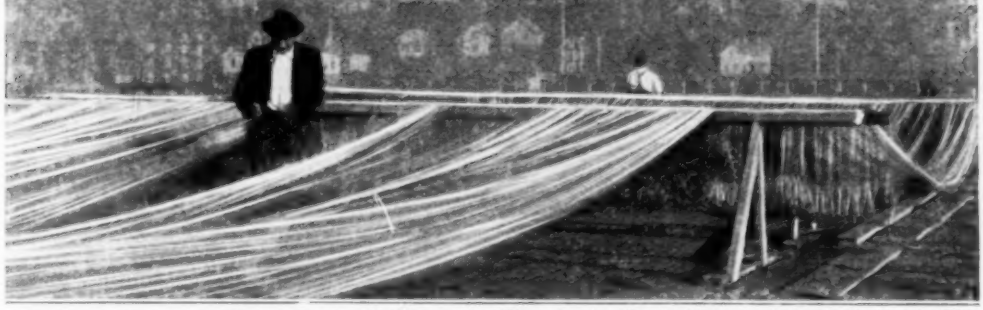
American exports in October, last year, exceeded all previous records for the month and also broke those of every other country. In spite of trading restrictions and submarine warfare, foreign business amounted to $49,000,000 more than in the previous year and doubled the figure for October, 1913, when peace prevailed. Thus conclusive proof is given of the oft-repeated claim that the present shipping situation is due to the enormous volume of freight that is being handled, rather than to the enemy's piracy.

HOW GERMANY ECONOMIZES ITS LUBRICANTS

The German's ability to take account of very small things, when seeking to economize, has made possible, it is said, a saving of as much as 40 per cent in lubricants in factories where it was thought that the minimum of consumption had already been reached. The new plan is to assign to one person the task of oiling several machines, that individual being especially trained to use as little lubricant as possible and to collect the oily waste and oil accumulated in drip pans. In addition, each machine operator is given a small emergency oil supply for which he is held strictly accountable.

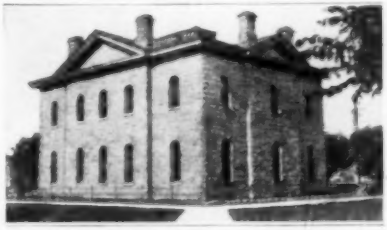
Intimate Glimpses of Astoria, Oregon

by Our Traveling Editor



Mending Seines on the Water Front: A Picturesque Glimpse of a Typical Phase of the Activities in This Little Town of Many Salmon Fishers and Cannery Workers

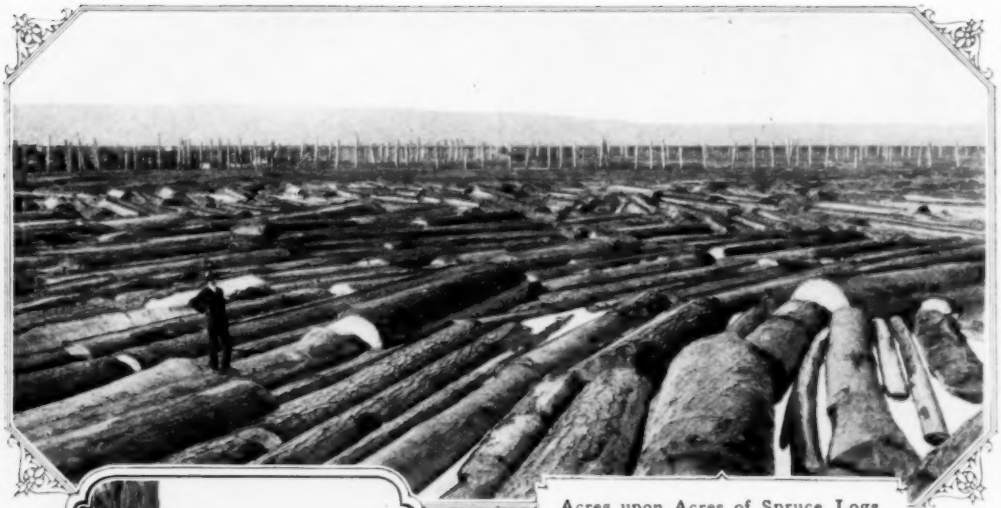
ORIGINALLY a fur-trading post, Astoria was built on the first available spot up the banks of the Columbia River from its mouth. The hills along the river were too steep, so the city began to grow on a low strip of tide land over which the water flowed at high tide. Buildings were all built on piles and the tide of the ocean swept in and out underneath. As the town grew into a lumbering and fishing community, streets became necessary. These, like the houses, were likewise built on piles, and heavy planks were used to form the street surface. Today Astoria is probably the only city in the world with piles for its entire foundation. Its principal streets, its buildings, and houses are all propped up on piles from 6 to 10 ft. above ground. However, in its appearance Astoria is not noticeably different from other cities. There is little to indicate that it is built entirely on piles.



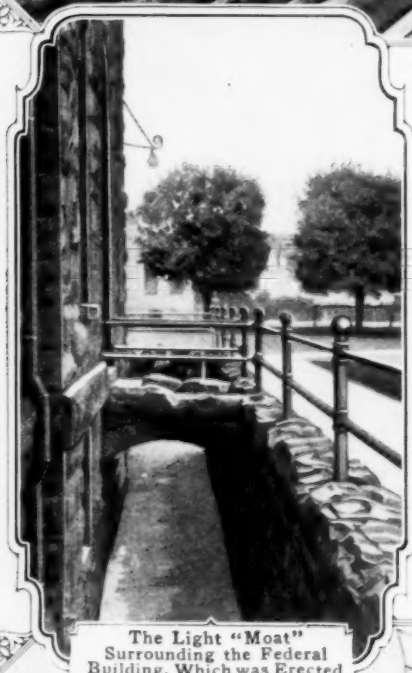
The Federal Building was Erected Before the Level of the City was Raised. As a Result the Structure is Surrounded by a "Moat" and What Appears to be the First Floor Is in Reality the Second

Naturally, with the tide sweeping in and out under the city, sanitation conditions were appalling, so after taking a vote on the situation it was decided to raise the city and fill in

Looking North in Eleventh Street Toward the Docks: One would Not Suspect That the City, Its Streets Buildings, and All, were Built on Piling, but Such Is the Case, Nevertheless



Acres upon Acres of Spruce Logs Selected and Cut under Government Contracts to be Made into Aeroplanes for Use against the Huns



The Light "Moat" Surrounding the Federal Building, Which was Erected Before the City was Raised to Its Present Level

The Cage Protects the Tombstone of an Early Settler Buried Adjacent to a School

All of the Streets are Paved with Planks Like This One, but in the Business Section Most of Them Have Asphalt Surfaces. Astoria Is a City on Sticks, and Fire Insurance Is as Hard to Get as Water in a Desert

Lumber Mills Also are Built on Piles along the River so That There Is a Ready Means of Transportation for Raw Materials and Finished Products

When Repairs Are in Progress, One Gets a Glimpse of Astoria's Pile Construction

When Ascending from One Street Level to the Next, One may Select His Steps to Suit His Stride, as is Herewith Illustrated

One Salmon Cannery after Another Flanks the Water Front. The Sides of the Piers Are Boat Anchorages for the Fishermen and the Piers Themselves Places for Drying and Repairing Nets

the low ground underneath. Streets, buildings, and everything were then raised from 3 to 10 ft., a concrete retaining wall was built along the water front, and great suction dredges began the task of filling in the space under the city. This work has been only partly completed, and the dredging and filling-in process will probably be continued for some time. This is necessary because of the constant settling of the filled-in ground.

The streets had to be raised and rebuilt on piling. Most of them are paved with planks and many are asphalted over the planking. Many streets are still "hollow," and when a wagon goes over, a very peculiar resonant sound is the result.

The filling-in process has also created some very unusual problems which thus far are only partly solved. A sewer system was put down before the filling in began, but when they were covered the ground settled and the sewers broke, necessitating the tearing up of the street structure to effect repairs. At the present time the city is being constantly torn up for new sewer repairs, and the expense of this is tremendous.

Of course, some means of securing ventilation under the streets and buildings was necessary, and to accomplish this, ventilators have been erected every few feet. Without them the filled-in ground would never dry out.

As might be imagined, the danger of fire is one that will probably never be overcome. Insurance rates in Astoria are almost prohibitive, and many underwriters have refused to take the risk on property at any premium. Citizens are also agreed that if a fire ever got started and made any headway at all before being discovered, the city would be quickly wiped off the map.

When the tides swept back and forth under Astoria's pile foundation the piling kept in good condition with very little attention, but with the filling-in and exclusion of light the piles have rotted at a terrific rate. They have been attacked by a boring worm that makes a pile look like sponge cake in a few weeks. Mold and several varieties of wood-destroying fungi have also added to the difficulty of keeping Astoria on her "stilts." Thus far no effective means have been discovered to overcome this trouble. Creosoting, tarring, and various chemical treatments of the piles seem to have added only to the fire danger.

Salmon fishing and canning, lumbering, and shipbuilding are the industries upon which Astoria is almost wholly dependent and at which the vast bulk of the population is employed. Probably 80 per cent of the population is foreign-born. They are for the most part Scandinavians; Finns, Slavs, Poles, and Danes. Very few of them have become naturalized Americans, but the majority have taken out their first citizenship papers so as to comply with the requirement of the law which makes this necessary before a fishing license is granted.

Times were never more prosperous in Astoria than they are right at present. Fishermen are now getting 10 cents a pound for salmon delivered at the canneries along the water front. Prior to this year, three cents a pound was the prevailing price. Shortage of labor is general and wages are higher than ever before.

Astoria also has an extensive trade with Alaska, and it is the headquarters of many fishing vessels that operate in the Alaskan waters. It formerly enjoyed a splendid coastwise commerce, but this has been almost brought to a standstill by the requisitioning by the government of most of the ships.

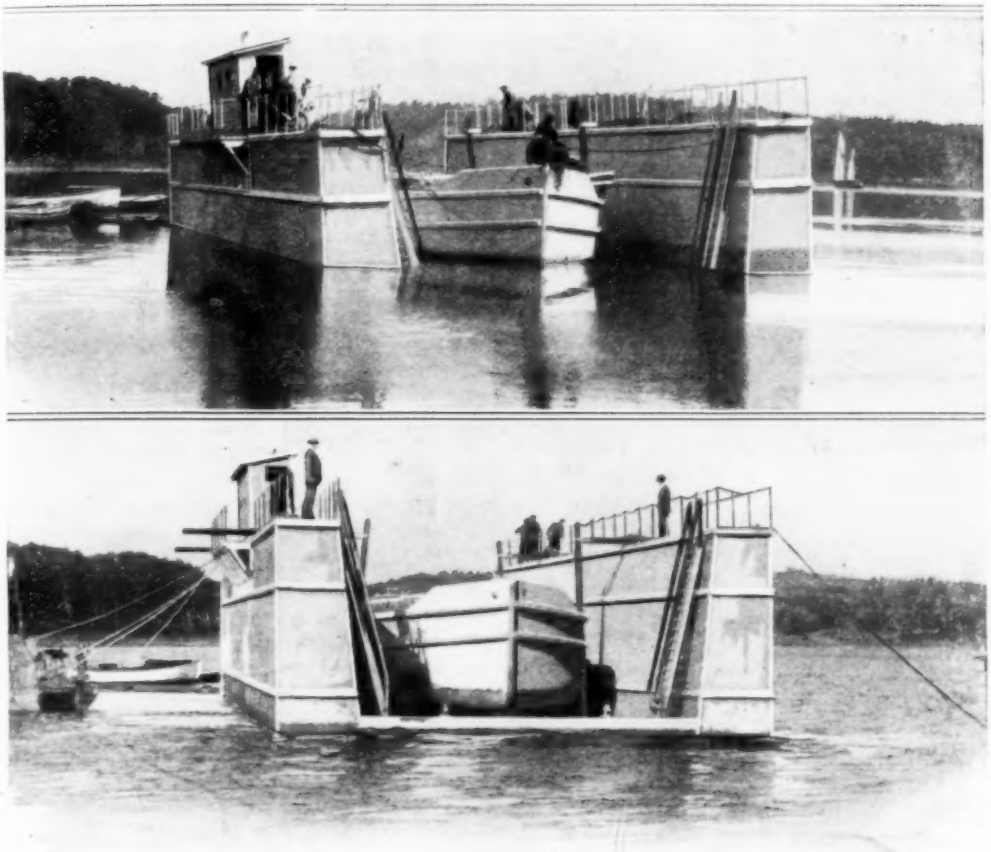
Most of the lumber now being cut in the vicinity of Astoria is going into ships, and during the last few weeks huge government contracts for aeroplane spruce have been placed with Astoria mills. As in other Oregon cities wood is the universal fuel and building material.

FERRO-CONCRETE FLOATING DOCKS

By ROBERT G. SKERRETT

JUST as the concrete ship may help measurably to solve our problem of providing enough craft for water transportation so, too, the granolithic floating dry dock may play a prime part in taking care of our vastly increased marine tonnage. Indeed, our existing dry-docking facilities are woefully inadequate, and unless these necessary aids to shipping are greatly multiplied, and quickly, we shall not be able to give our merchant craft the overhaulings and repairs that they will need to make them fit to continue in service.

The floating dry dock is the likeliest means to this end, but modern docks of this sort heretofore have required a good deal of steel in their construction—just the kinds of material that are used in the fabrication of ships. With a scarcity of angle bars, plates, and I-beams, how shall we build more floating dry docks? A Norwegian engineer who has come to this country to estab-



A Ferro-Concrete Floating Dock in Use in Norway: The Upper View Shows the Structure Submerged to Receive a Reinforced-Concrete Barge. The Lower Picture Shows the Dock Pumped Light, Bringing the Barge above Water

lish a plant, following upon his successes at home, proposes that we construct our needed floating docks of ferro-concrete, and by way of proof that this is entirely practicable he points to one turned out at Moss, Norway, by him for a firm of yacht builders in Christiania.

His granolithic floating dock is 80 ft. long, 36 ft. wide, and 20 ft. from top to bottom. It has a lifting capacity of 75 tons, which means that it is able to raise clear of the water a vessel having a total dead weight of 150 tons when full laden. Of course, the craft would have to be docked when light. The illustrations show the dock while handling a reinforced-concrete barge rated at 100 tons.

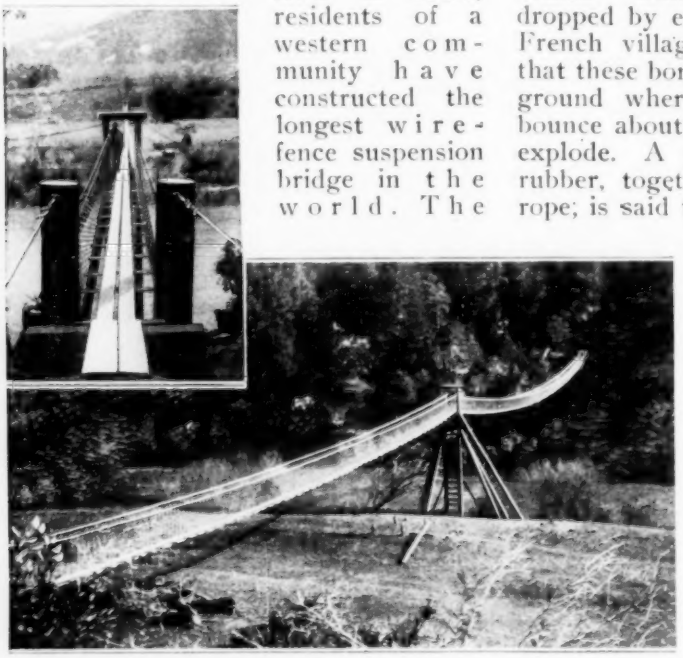
In operative principles the ferro-concrete floating dock does not differ from one fabricated of steel, but it calls for very little of that metal for reinforcement; and the time required to build the granolithic dock is very much shorter, indeed, than that demanded for the production of one of steel. The ferro-concrete structure can do all that its steel rival could be expected to do. At his yard in Norway, this young engineer, who frankly admits that he learned a great deal from Americans when working on the Panama Canal and the Detroit River tunnel, has under way two floating dry docks of reinforced concrete, each of which will be able to lift 7,000 tons. That is to say, these docks will have a capacity equal to that required to deal with ships of 14,000 to 15,000 tons full-load displace-

ment. Such is his long stride from his initial dock of 75 tons. The knowledge obtained from his first essay in this direction has satisfied him of the correctness of his system and its susceptibility to radical expansion.

The floating dock can be towed wellnigh anywhere; under some circumstances it can go to the injured ship if the damaged craft cannot be brought to the dock; and, finally, the floating dock can lend aid to the injured vessel to the full measure of its lifting capacity. This may be sufficient to raise either the bow or the stern of a full-laden steamer far enough out of the water to make permanent repairs, or to get it temporarily fixed up so that it can reach a harbor without discharging the cargo; in short, save precious time.

CHILDREN WALK TO SCHOOL OVER GOSSAMER BRIDGE

To enable their children to get to school without crossing a turbulent river in boats, residents of a western community have constructed the longest wire-fence suspension bridge in the world. The



Prior to the Erection of this Long Wire-Fence Suspension Bridge, Children of the District Daily Risked Their Lives Crossing a Turbulent Mountain Stream in Boats in Order to Get to School

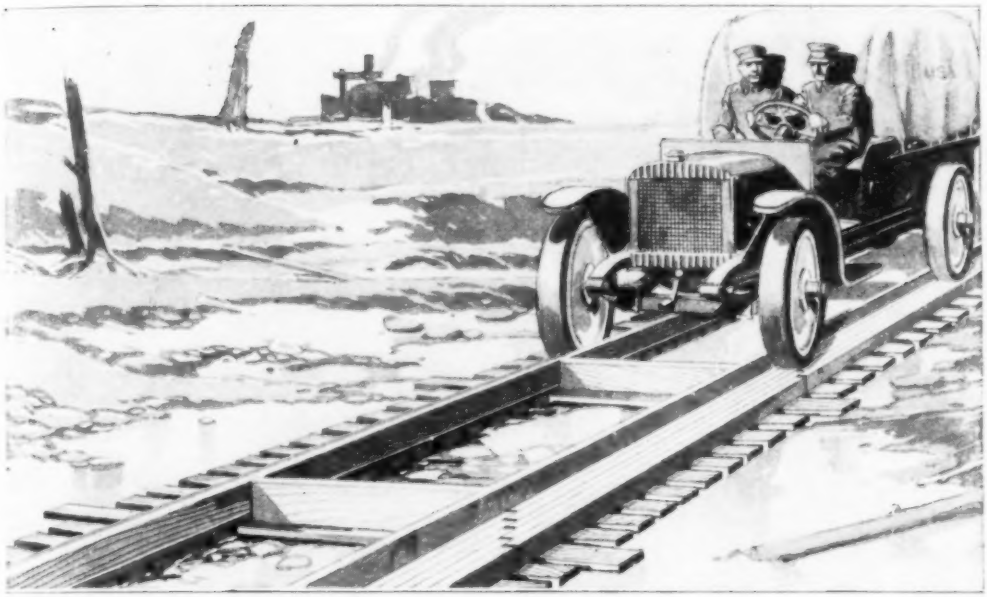
structure is 662 ft. in length. The main span is 380 ft. and is 63 ft. above low water. Men of the locality donated their services in building the bridge, and the materials were paid for chiefly from the proceeds of a series of entertainments. Completion of the bridge occasioned a great celebration in which the people of the countryside participated.

"BOUNCING BOMB" GERMAN FLIERS' NEW MISSILE

One of the newest destructive devices of the Germans are "bouncing bombs" which have recently been dropped by enemy airmen flying over French villages. It has been found that these bombs leave no mark on the ground where they first strike, but bounce about six feet into the air and explode. A padding of leather and rubber, together with a wrapping of rope, is said to be responsible for this resiliency. A special fuse causes the burst in mid-air.

FRENCH ARMY HAS LABORATORY TRUCK

A motor car containing a complete bacteriological laboratory which can be set up in an hour and a half and measures 12 by 18 ft. has been presented to the French army, according to recent reports. The equipment includes bacteriological incubators, microscopes, an autoclave, and other accessories. Special containers are provided in which the apparatus can be carried without danger of injury. Both the car and the laboratory are electrically equipped. It is anticipated that this outfit, said to be the first of its kind, will be of immense value to the medical department of the army.



Section of an Economical Wooden Track for Motor Trucks, Which can be Laid without Bolts and Nuts and is Designed Especially for Military Use in Marshy or Sandy Regions

TRUCK ROADWAY OF WOOD FOR WAR SERVICE

A new war invention is an economical motor-truck roadway of wood, for use in marshes or sandy places, that is built in sections and can be laid without bolts. Each unit has a hollow frame resting on ties, while extending from either side are boards on which lie the longitudinal timbers forming the track. The latter consists of two-by-fours set on edge and so laid that the ends of each section dovetail into those adjoining.

NEW PIT AND BUCKET MAKE ASH REMOVING DUSTLESS

A patented ash pit and bucket make it possible to remove ashes from beneath a hot-water or steam boiler without raising any dust in the basement. The pit is made the same diameter as the boiler base and 7 in. deep, and is fashioned in the concrete floor. At the rear is a chute, 9 in. wide and 7 in. high, connecting with a well, 18 in. deep, just back of the boiler. A trap-door gives access to this well, in which an ash bucket is kept. Instead of removing the ashes through the front, a long-handled shovel is used to push them back through the chute into the bucket. When this has been filled it may be taken out and emptied without raising any dust.

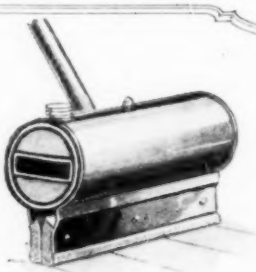
Removing Ashes Made a Dustless Task: With This Patented Pit Ashes are Shoved through the Chute at the Rear into a Covered Bucket

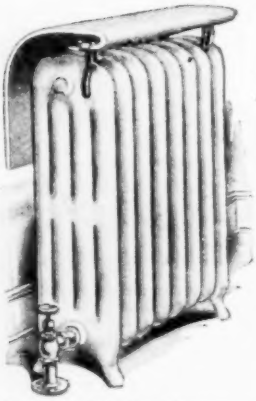
¶ Two Belgian communities, according to dispatches, were recently ordered to deliver a total of 550 well-fed cats to the German authorities, the object apparently being to relieve in a measure the shortage in fats by sacrificing the Belgians' family pets.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Chemically Prepared Dusting Cloth in Rolls at 7 Cents a Yard; Broom Covers of Same Material $2.20 a Dozen

Reservoir Floor Oiler with Valve That Stops Flow When Device Is Idle. Price $1.50

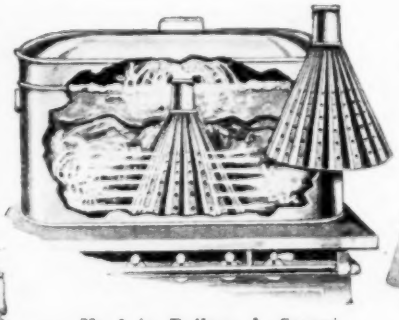




Brackets Holding Cretonne Cover That Protects Wall. Price, Frame, $1.50

If Clothes Start to Wind on Rolls, the Wringer on This Electric Washing Machine Stops. Outfit, Price $150 and $250

Floor Lamp, Lower than Usual Ones, with Tray for Cards or Sewing Materials. Price $12

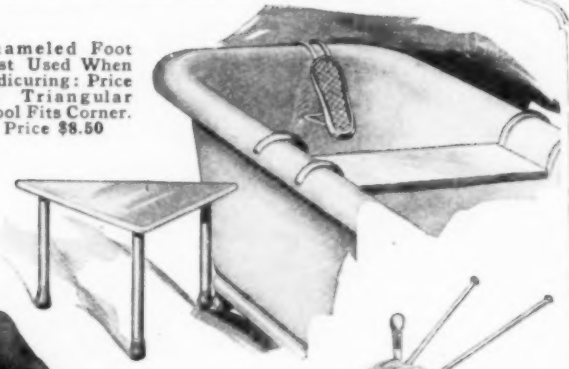


Used in Boiler: A Steam Washer That Cleans Clothes Automatically. Price $1.85

A Skirt Marker That may be Used without the Services of an Assistant. Price $2

INTENDED FOR THE HOME AND ITS MEMBERS

Humidifier for Bread Box Keeps Bread, Rolls, and Cakes in Fresh Condition



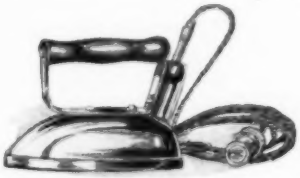
Enameled Foot Rest Used When Pedicuring: Price $1. Triangular Stool Fits Corner. Price $8.50

Wood-Finished Steel Humidifier That Forms an Attractive Cover for Steam and Hot-Water Radiators: The Size Determines the Price

Wool Holder Fitted with Revolving and Removable Spike. Price $2.50

Folding, Metal Luncheon Table of Medium Size and Substantial Construction. Price $3.50

Knitting Shell in Mahogany: Top Holds Wool Ball; Body Is Cabinet for Work. Price $17



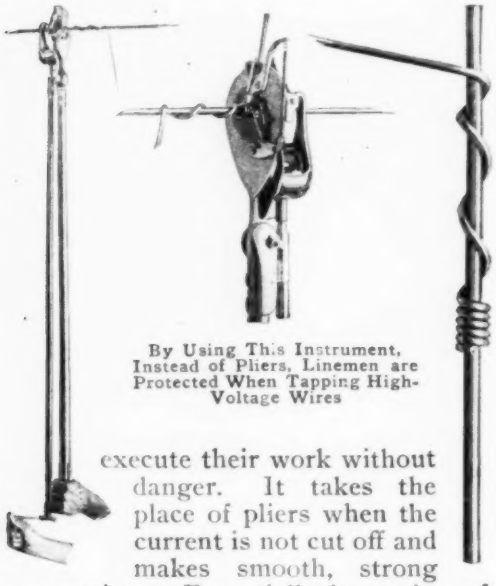
Electric Iron with Permanent Plug That Obviates Dangers of Burn-Outs and Blown Fuses. Price $5

For the Birds: A Feeding Shelter Supplied with an Automatic Seed Hopper. Price $4.75

For Identification: Wrist Strap Showing Soldier's Name, Regiment, and Religion. Price $1.25

WINDER PROTECTS LINEMEN TAPPING LIVE WIRES

For tapping charged, high-voltage electric feed lines, a wire-winding tool has been devised to enable linemen to



By Using This Instrument, Instead of Pliers, Linemen are Protected When Tapping High-Voltage Wires

execute their work without danger. It takes the place of pliers when the current is not cut off and makes smooth, strong connections. Essentially it consists of a winding head fitted with a pair of long insulating handles. One of these is supplied at the lower end with a crank and at the upper extremity is connected, through gears and a universal joint, with the winding mechanism. The method of operation is obvious.

GERMANS ENCOUNTER DEFEAT WITH CREWLESS VESSELS

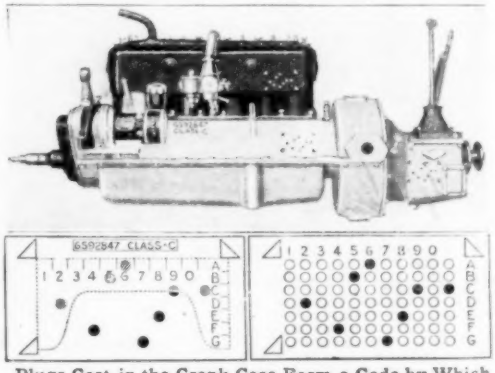
Electrically controlled crewless motorboats carrying heavy charges of high explosives have been unsuccessfully employed by the Germans in operations near the Belgian coast. The craft have not only proved ineffective, but have been easy prey for British patrols. Even more interesting than the complete failure of the experiment is the fact that the much-vaunted German ingenuity has apparently not fathomed the secret of radio control. Instead of being governed by wireless, the vessels have wire connections with the shore. Driven at high speed by twin internal-combustion engines, they carry drums on which from 30 to 50 miles of insulated cable is wound. These unreel as the vessels proceed and provide in a clumsy way the necessary transmission mediums. Land operators, directed by signals sent out by airmen following some distance in the wake of the vessels, steer the latter electrically. The purpose is to destroy allied ships by ramming them and detonating the explosive charges carried near the bows of the motorboats.

STRAY BALLOON DOES HARM IN THREE STATES

Unusual excitement was aroused in parts of three states when a new type of observation balloon, without a crew and trailing 6,000 ft. of steel rope, escaped from its moorings at a point in Nebraska and drifted about for 24 hours. The craft moved across Kansas into Oklahoma and finally back into Nebraska, where it was captured. The heavy cable, dragging on the ground, broke down telephone and telegraph lines and otherwise damaged property.

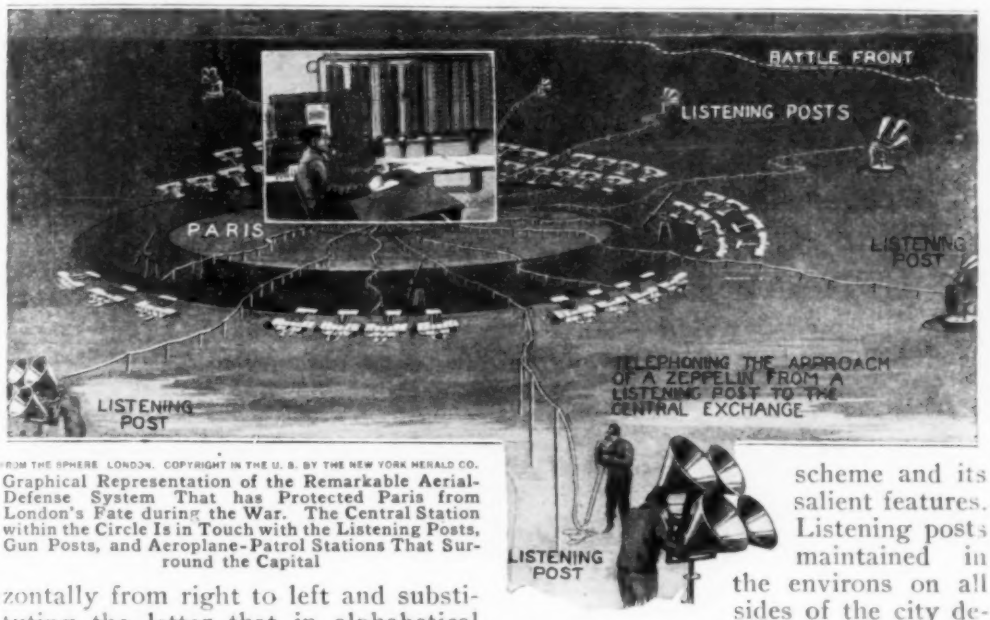
NUMBER SCHEME FOR MOTORS HAMPERS CAR THIEVES

Its indestructibility is the advantage of a new numbering system for automobile motors. Steel pegs are cast integral with the crank case or transmission box in such a pattern that the number they represent is indicated



Plugs Cast in the Crank Case Form a Code by Which a Car's Number may Always be Determined. By Drawing the Card at the Lower Left over That at the Right, the System is Demonstrated

when a square is drawn slowly over them from top to bottom. The class is shown by pulling the square horizontally from right to left and substituting the letter that in alphabetical sequence corresponds to the number registered by the first pin.



FROM THE SPHERE, LONDON. COPYRIGHT IN THE U. S. BY THE NEW YORK HERALD CO.

Graphical Representation of the Remarkable Aerial-Defense System That has Protected Paris from London's Fate during the War. The Central Station within the Circle Is in Touch with the Listening Posts, Gun Posts, and Aeroplane-Patrol Stations That Surround the Capital

PARIS AIR-DEFENSE SYSTEM EXPLAINED GRAPHICALLY

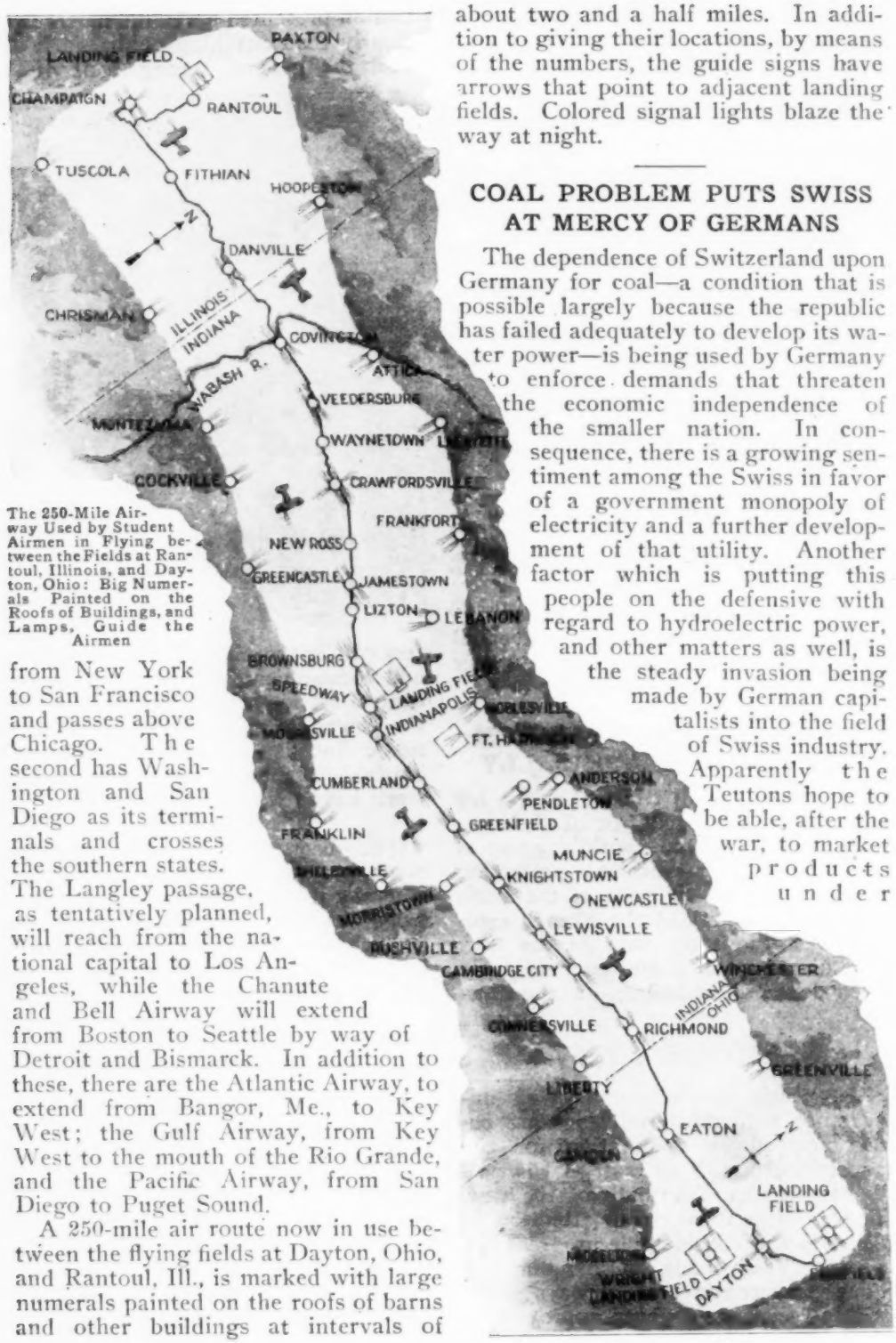
Agitation is still rife in London for the establishment of aerial defenses that will give the world's greatest metropolis as efficient protection against German air craft as the Paris system has provided the French capital since the early days of the war. The air guard of Paris has previously been described at length, but the illustration presented herewith shows more clearly than anything published in the past the general arrangement of the

scheme and its salient features. Listening posts maintained in the environs on all sides of the city detect the approach of enemy machines and communicate the information to a central station which is in touch with the gun posts and aeroplane-patrol stations. In this way the invader is given battle before he can reach Paris and work havoc with bombs.

¶ It has been announced that an agreement has been made with distillers whereby the country's entire output of wood alcohol will be taken over by the government. Private consumers will be supplied on licenses issued by the Federal authorities.

NATIONAL AIRWAYS FOR AFTER-WAR FLYING

In nearly every country of importance national aerial lanes are being mapped in preparation for the widespread use of air craft that is sure to come as an aftermath of the war. The problem is receiving attention in America and considerable progress has already been made in handling it. Four transcontinental airways have within recent weeks been approved by the executive committee of the Aero Club of America, and the work of charting the routes and selecting landing places is in charge of a committee headed by Rear Admiral Robert E. Peary. These main arteries are to be known as the Woodrow Wilson Airway, the Wright Brothers Airway, the Langley Airway, and the Chanute and Bell Airway. The first one extends



The 250-Mile Airway Used by Student Airmen in Flying between the Fields at Rantoul, Illinois, and Dayton, Ohio: Big Numerals Painted on the Roofs of Buildings, and Lamps, Guide the Airmen

from New York to San Francisco and passes above Chicago. The second has Washington and San Diego as its terminals and crosses the southern states. The Langley passage, as tentatively planned, will reach from the national capital to Los Angeles, while the Chanute and Bell Airway will extend from Boston to Seattle by way of Detroit and Bismarck. In addition to these, there are the Atlantic Airway, to extend from Bangor, Me., to Key West; the Gulf Airway, from Key West to the mouth of the Rio Grande, and the Pacific Airway, from San Diego to Puget Sound.

A 250-mile air route now in use between the flying fields at Dayton, Ohio, and Rantoul, Ill., is marked with large numerals painted on the roofs of barns and other buildings at intervals of about two and a half miles. In addition to giving their locations, by means of the numbers, the guide signs have arrows that point to adjacent landing fields. Colored signal lights blaze the way at night.

COAL PROBLEM PUTS SWISS AT MERCY OF GERMANS

The dependence of Switzerland upon Germany for coal—a condition that is possible largely because the republic has failed adequately to develop its water power—is being used by Germany to enforce demands that threaten the economic independence of the smaller nation. In consequence, there is a growing sentiment among the Swiss in favor of a government monopoly of electricity and a further development of that utility. Another factor which is putting this people on the defensive with regard to hydroelectric power, and other matters as well, is the steady invasion being made by German capitalists into the field of Swiss industry. Apparently the Teutons hope to be able, after the war, to market products under

Swiss labels and thereby avoid the prejudice that will everywhere confront their own exports.

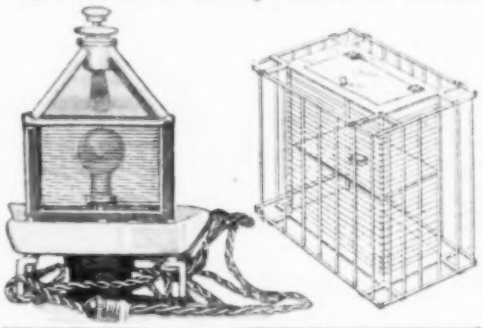
Because of the limited supply of coal that the little republic has been able to obtain from its northern neighbor, the train service has been materially reduced, and houses, factories, and public buildings have had only a partial fuel supply. Aided by these circumstances, the Germans have virtually compelled the formation of a Swiss syndicate that guarantees the Berlin government $5,000,000 per month, in the form of a loan, and in return Switzerland is assured of a supply of 200,000 tons of coal per month. As a matter of fact the need of the people, in winter, is placed at fully 300,000 tons per month.

Being in such straits, it is scarcely to be wondered at that the little nation in the Alps is anxiously, if tardily, turning its thoughts to getting power from mountain streams in order that less coal may be needed. In discussing this problem a correspondent of the New York Times, citing Swiss authorities, declares that a government monopoly of electricity would make it "much easier for the country to maintain its threatened economic independence." Engineers have estimated that there are available for use the year round, 24 hours per day, 2,500,000 hp. that is now unused by the Swiss. The amount of electricity which Switzerland is now producing is only a fraction of this and—to the indignation of many—a considerable portion of this is being exported to Germany. Just as the Swiss railways were taken over by the government in order that they might be operated in the interests of the Swiss people, so, it is contended, the electrical power must be taken over to check German aggression.

¶A wireless message recently sent from the Philippine Islands to the Navy Department at Washington announced the completion of the government's chain of radio stations that now extends approximately halfway round the world.

FLYTRAP ELECTROCUTES ITS VICTIMS

A new electric trap for exterminating flies and other pestiferous insects

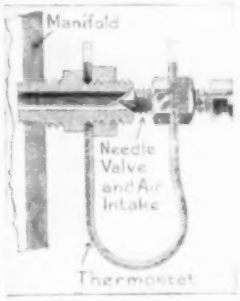


At the Left Is an Electric Flytrap. The Diagram Shows the Arrangement of the Live Wires and Protecting Rods

has appeared on the market. It contains an incandescent bulb, which when lighted at night attracts the insects to it. Surrounding the light are closely spaced live wires that electrocute the creatures as they fly toward it. To prevent accidental shock in handling the trap, it is covered with outer bars. By means of a flexible cord, current to supply the trap can be obtained from any light socket.

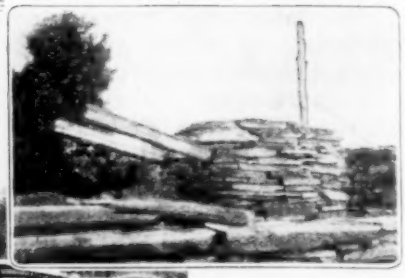
FUEL-SAVING AUTOMATIC AIR VALVE FOR AUTOS

A refinement for motor-car engines, designed to economize fuel automatically, consists of a thermostatic air valve inserted in the side of the engine's manifold intake. The needle with which this valve is closed is in the form of a set screw attached to a U-shaped thermostatic arm. As the engine and this arm become heated the needle is withdrawn, admitting an amount of air in direct proportion to the engine's temperature.



PICTURES THAT TELL STORIES OF INTEREST

Little Boys, Aided by an Older Friend, Built This Battleship of Flat Stones. It Is near an Old Quarry in the Catskill Mountains

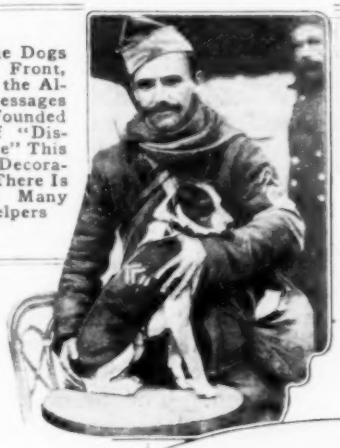


Above Is a View of the Forward Turret with Its Wooden Guns. Buried beneath the Ship, Which Is 28 Feet Long, Are the Names of the Builders, in a Sealed Bottle

So Well does This Lincoln Statue in Newark, New Jersey, Reveal the Great Man's Friendliness of Heart That Little Children Love to Work and Play near It

A Penny Dance Hall in Los Angeles Recently Accumulated So Many Pennies That the Banks could Not Give Nickels in Exchange. To Ship Them Elsewhere Was Too Expensive and so the Proprietor, Once a Newsboy Himself, Offered Six Cents for Every Nickel the Newsboys would Bring Him. The Picture Shows How Eagerly They Responded

TO ALL ACTIVE, PATRIOTIC BOYS AND GIRLS



One of Many Fine Dogs on the Western Front, Trained to Help the Allies by Carrying Messages and Finding Wounded Men: Because of "Distinguished Service" This Animal Wears a Decoration. Just Now There Is Great Need for Many More Such Helpers

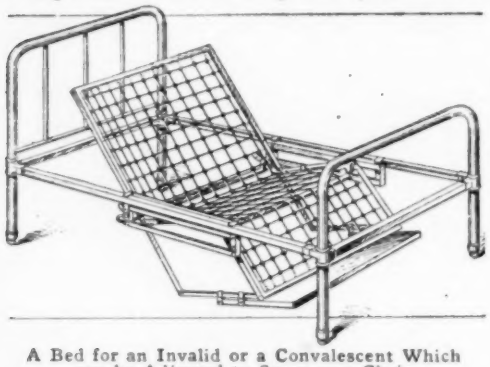
Above Is a Russian Boy Scout, Especially Honored for Braving Bullets to Succor This Big Soldier

War-Time Standards Prevail in the Play of the Children on This Popular Ocean Beach. Instead of the Familiar Forts of Sand, Real Trenches Are Now the Thing. The Flags of the United States and Her Allies Leave No Doubt as to the Sympathies of the Young Shovelers

The Dubuque, Iowa, Boys and Girls on the Left Were Prize Winners in a Big Campaign to Save Their City's Trees from the Tussock Moths. On the Table Are Several Bushels of Moth Eggs Which They Gathered. After the Picture was Taken the Eggs were Destroyed

ADJUSTABLE BED SERVES AS INVALID CHAIR

Especially convenient for convalescents is a new bed having a spring composed of three hinged sections that

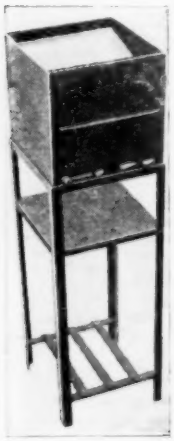


A Bed for an Invalid or a Convalescent Which can be Adjusted to Serve as a Chair

can be adjusted to serve as a reclining, or invalid, chair. At one end of the spring is a foot rest that can be drawn into position when needed. Suitable means are provided at the sides to hold the spring in any desired position.

DISCARDED CARBON HOLDER FOR MOVIE BOOTHS

To prevent fire in a motion-picture booth, caused by films coming in contact with discarded carbon sticks that are still hot, a special holder has been devised into which the useless pieces can be thrown with safety. It consists of a sheet-metal box, 9 in. square, the top of which slants toward the center where there is a slot and a trap that automatically admits the stick ends dropped on it. A stand is provided for the box.



¶A tough cotton fabric to which a paper backing has been added is being used in making flour sacks that are claimed to be dirt-proof and hence more sanitary than common sacks.

AEROPLANE COLLIDES WITH MOTORCYCLE

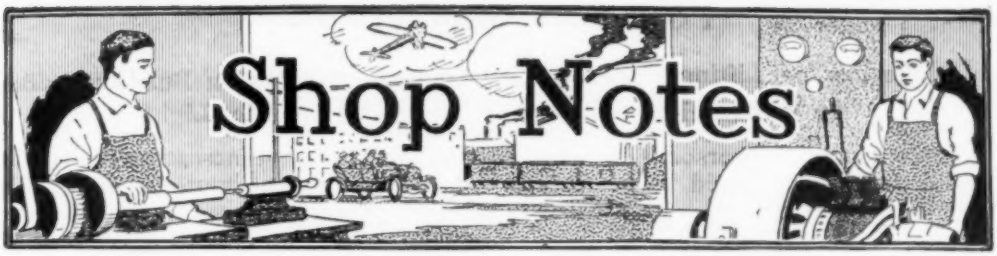
What is probably a type of accident that is entirely new in the annals of aviation, occurred when an aeroplane collided with a motorcycle a short time ago on a street near the flying field at Toronto, Canada. A man on a motorcycle, with a companion in a sidecar, was preparing to go to the aid of an airman making a forced landing, when the propeller of the air craft struck the motorcycle, wrecking it and killing the two men. The aeroplane was badly damaged, also.

NO PACKING IN ONE-PIECE EXPANSION JOINT

The advantages claimed for an improved expansion joint for piping, whose temperature is subject to change, are that it is made in one piece, requires no packing, and takes up less space than loops or U-bends. The article operates on the principle of an accordion, a series of deep corrugations being provided which, in high-pressure joints, permit a play of 2 in. The corrugations, being machined from a solid block, are very durable. Limiting bolts, whose range can be adjusted by means of nuts, prevent too great expansion or contraction.

PREFER "ROLL OF SERVICE" TO "ROLL OF HONOR"

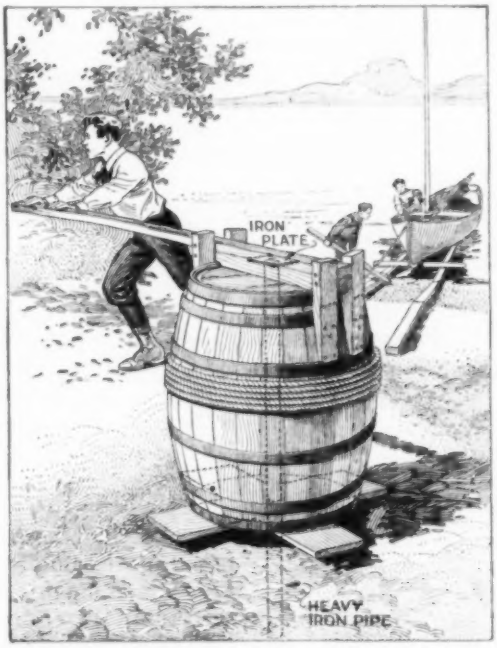
That "Roll of Service" is a better term than "Roll of Honor" to apply to lists of men engaging in the present conflict is the contention of certain Civil War veterans and others. The argument is advanced that it is out of place to make up any "roll of honor" —other than the names of those who died in the service—until after the war, when the character of each man's service will be a matter of record.



Vertical-Drum Windlass Made of Old Barrel

By C. S. GREEN

A PRACTICAL windlass was made to haul a small sailboat from the water, and the method of construction is so simple that many other uses can be found for this type of rigging. The boat was arranged on skids with the usual rollers, and the hauling rope was fastened to the bow, as shown. By steadily winding the rope on the barrel drum, the craft was drawn from the water without danger of damage, and then moved to the desired position on land. In this instance, the heavy iron pipe, on which the drum pivots, was set into the ground. This is a handy method in many cases, but where the windlass is to be shifted from place to place frequently, it is best to set it on a substantial foundation of timber.



A Powerful Windlass can be Rigged Up Quickly with a Barrel as the Drum, and by Providing a Suitable Frame, the Outfit can be Made Suitable for Moving from Job to Job

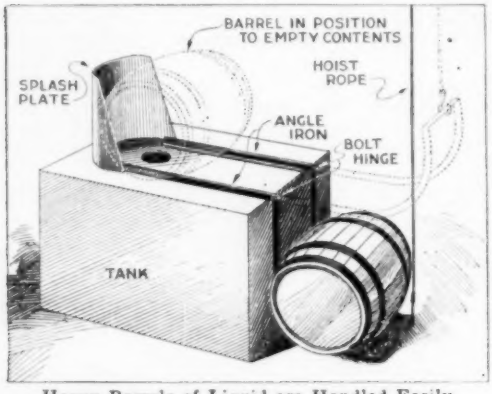
A strong barrel was used, and the bands were set tightly after both heads had been put into place. A cross arm slipped over the iron pipe serves as a bearing at the bottom, and the top of the barrel is reinforced with 2 by 4-in. pieces, as shown. An iron plate caps the upper end of the pipe. The push bar is made to be removed handily, and can be set shorter for use in limited space. When heavy loads are to be handled, an additional push bar on the opposite side can be used.

Accurate Method of Setting Thread Tool in Lathe

A thread tool may be set accurately in a lathe by the following method: Set the lathe centers carefully in their usual position. Turn a cold-rolled steel plug, 1 in. in diameter and the length of the piece to be threaded. Cut a deep groove, the shape of the thread groove to be cut, in the plug, using the tool in the ordinary manner. Then reverse the plug, end for end, and fit the thread tool in the groove. The extent to which the tool is out of alinement is thus shown. The tool is then adjusted about one-half the extreme extent of the error indicated. The groove is next cut slightly deeper with the tool in the new setting, and the plug again reversed on centers. The tool is then fitted into the groove, and the process repeated, if necessary.—F. Shrier, Derby, Conn.

Device for Lifting Barrels to be Emptied

It is found cumbersome to handle heavy barrels of liquid to be poured

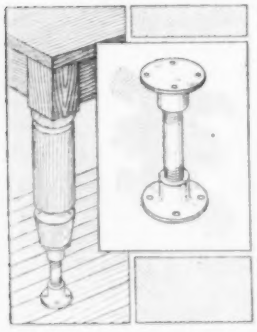


Heavy Barrels of Liquid are Handled Easily by One Man with This Arrangement

into an overground tank, and the device shown in the sketch was built so that one man can easily handle the barrels. The barrel is rolled onto the cradle of strap iron and hoisted by means of the tackle. It rolls along the angle-iron ways to the splash plate, where it is emptied. This plate causes the liquid that is splashed around the tank opening to flow back.—Otto Kraft, Chicago, Ill..

Adjustable Leg for Table or Bench

For use on floors that are not level, or which have depressions, a table or bench leg that is adjustable is a convenience. One of this type can be made out of pipe fittings, as detailed. A flange is fastened to a suitable length of pipe and the upper flange is set on to give room for adjustment. By the use of a pipe wrench, or other means, the leg is set to the proper height and fastened in place.

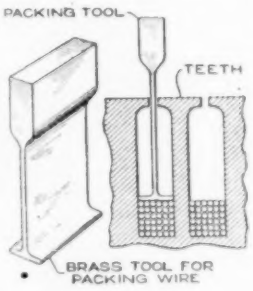


Tin Foil Winding on Bulb Intensifies Electric Light

A handy way of increasing the power of an incandescent lamp which is to be used over a small area is to cover the upper portion of it with a winding of tin foil, held in place with tape. The tin foil acts as a reflector, concentrating the light at the lower end of the bulb and making a shade of the ordinary type unnecessary. This method, resorted to as an emergency kink, proved so successful that its use was continued.—Ernest Schwartz, Brooklyn, N. Y.

Tool for Packing Wires in Slots of Motor Fields

In winding or repairing motors of the type known as "semi-inclosed slot motors," it is necessary to use a special tool to pack the wires tightly. Such a tool must have a thin shank, so that it may be operated through the slit between the teeth, and yet have a flat end to act as a tamper, as shown in the sketch. This tool, nicknamed by most motor-field winders "doodlehoppers," can be made from a brass rod of rectangular cross section, all the work being done with a file. The general shape of the tool is as shown, but the dimensions should be adapted to the work in hand.



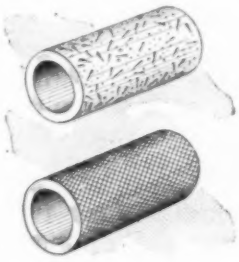
Check-Out Board Helps Locate Mechanics in Shop

Shop or office business often takes an employe to another department than his own for a short time. While he is away the foreman, or other official, may want to communicate with him without delay. As an aid in locating absent men, a check-out board

is used with success in a large plant. Each man in the department has a hook on the board, his name being placed under it. When he leaves the room for another department, he writes the fact on a blank shipping tag and hangs it on his hook. If an employe is absent from business entirely, the cause of his absence and date last at work are written on a card and placed on the board by the shop clerk. Thus by referring to the check-out board a record of the absentees is at hand.

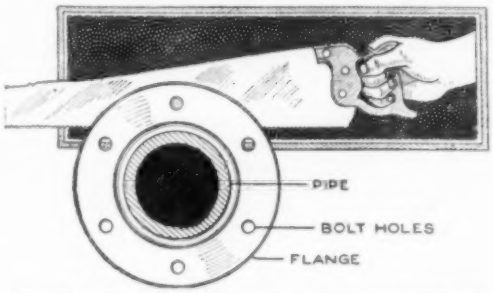
Bushing Fitted Snugly by Knurling or Roughening Surface

Not infrequently bushings become loose, or are machined slightly undersize, and some mechanics use a cold chisel or prick punch to roughen the exterior surface, causing projections which make the bushing stay in place. A better method is to replace the bushing in the lathe, and increase the diameter by using a knurling tool on the exterior surface. This increases the diameter sufficiently, even when the bushing is 1/32 in. undersize. It makes a better job than the first-mentioned method.—G. A. Luers, Washington, D. C.



Old Gaskets Sawed Out from between Flanges

Often when a leaky gasket is encountered in a flange-joint pipe line, the pipes are so firm that the flanges cannot be pried apart to permit the ready removal of the old gasket. In such instances the latter can, after the bolts have been removed, be cut out with a saw, preferably one which has been discarded as unfit for regular use. It is essential that the adjacent faces of the flanges be clean before the new gasket is inserted, otherwise the joint is likely to leak. Where possible, the flanges should be forced apart, so that

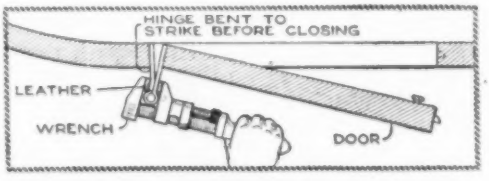


The Old Gasket is Removed Handily by Sawing It Out with an Old Saw

they can be scraped with a chisel. Where this cannot be done, the saw can be used as a scraping tool. In setting the bolts, all should be tightened to approximately the same tension. Otherwise, unequal strains may result, causing the joint to leak, or the gasket to blow out.—C. C. Williams, Des Moines, Ia.

Rattling of Automobile Doors Overcome by Setting Hinges

The doors of many automobile bodies, particularly the light cars, loosen up after considerable running, and cause a disagreeable rattle. Rubber-head nails, or strips of rubber cut from inner tubes, are frequently used to take up the play between the door and frame. A method that is more effective and requires a minimum of work is that of bending the hinge, as shown, using a wrench with a pad between the jaws to prevent marring the paint. The hinge so bent also assists



A Simple Remedy for the Rattling of Automobile Doors Is to Bend the Hinges Slightly

in opening the door, the springlike action swinging the door partly open when the catch is released.

Making Dentil Moldings for Cabinet Trim

By CHARLES A. KING

CORNICES and similar effects in cabinetwork often require dentil moldings, and a quick method of making them is a valuable bit of knowledge for the woodworker and craftsman. A

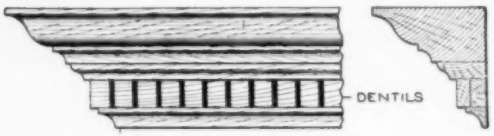


Fig. 1

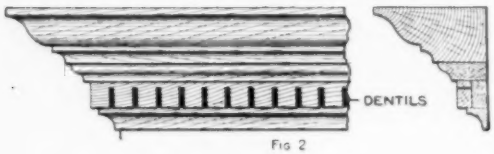


Fig. 2

Fig. 3 Fig. 4

The Dentils are Made Accurately and Quickly by Cutting Properly Spaced Grooves across a Board, and Then Ripping This into Moldings

circular-saw table can be easily fitted to cut several moldings economically and accurately. The resulting strips may be handled and fastened in place like moldings. Figs. 1 and 2 show the two types of dentils commonly used, applied to furniture, and interior or exterior finish.

In fitting the saw for cutting dentils, as shown in Fig. 5, a piece of straight hard wood, A, 1¼ by 2½ in., is fastened to the two cutting-off gauges B, to make them move as one, and a saw cut is made, at C, with the saw which is to be used in cutting the dentils. The saw is adjusted to cut the desired depth and the board, properly trued up, is passed over it, making the first cut E. To gauge the second cut F, and succeeding cuts G, etc., a nail, D, is set through the piece A, as detailed in Fig. 5, at the left. The distance H, between the saw cuts, is marked carefully on piece A, and the nail, of a size to fit easily but snugly into the saw cut, is driven through, so that its point projects an inch or more. The board is drawn back with the rest, in the usual manner. The board is then shifted so that cut E fits over the nail, thus gauging the next cut. Each succeeding groove serves in turn as a gauge stop for the nail, in locating the next saw cut.

When the crosscuts have been made, the board is ripped into strips, as at J, Fig. 5, of the desired widths, as at K, Figs. 3 and 4. The two kinds of dentils are provided by making the cuts of suitable depth and ripping the board to the proper-size moldings. The face of each strip of dentils is held against the face of the ripping gauge, or fence, and the strip is sawed to the desired thickness and height of dentil. If small dentils are desired, the cuts across the surface of the board may be made upon both sides of a board of sufficient thickness, and the resulting strips each ripped into two dentil moldings. In making saw cuts for dentils of the type shown in Fig. 4, a saw must be used which will make the bottom of the cut straight, as shown at L; an ordinary cutting-off saw makes the cut as shown at M.

Large dentils suitable for use on cornices may be made by the same general method. A grooving head must be used in making the cuts between the dentils. Instead of the nail

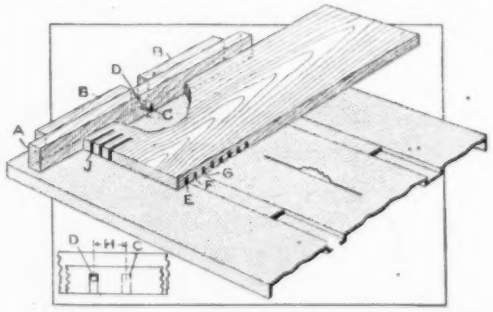


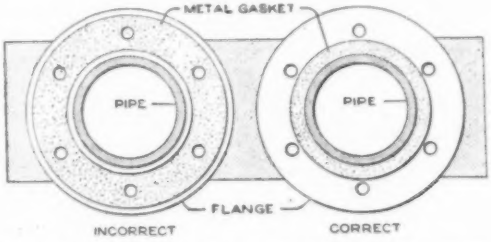
Fig. 5

An Ordinary Circular-Saw Table is Used for Cutting the Dentil Moldings, by Fitting a Gauge Device on the Usual Guides

D, Fig. 5, a piece of wood to fit the groove between the dentils is fastened securely to piece A, as a gauge stop.

Fitting Metal Gaskets Securely in Bolted Flanges

Where a metal gasket is used in the flange joint between two pipe lengths, it should be of relatively small diameter, and should be placed within the bolts, as shown, as against the incorrect method. The practice suggested is preferable because, where the gasket is of small area, the pressure to the square inch, imposed on it when the bolts are tightened, is much greater than if it has a large area, and a small-diameter gasket is squeezed tighter in the joint, relatively. Where rubber, or some similar yielding material is used for the gasket, it should be made by the method indicated as incorrect for metal. The bolts hold the gasket in

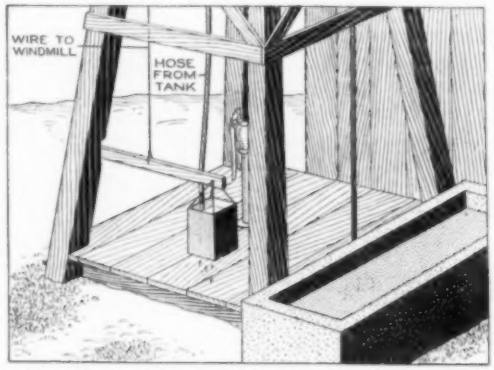


The Metal Gasket is Cut to Fit Inside of the Ring of Bolts and the Rubber One is Fitted to Surround Them

place, and the usual pressure is sufficient to insure a tight joint.

Device Regulates Windmill to Maintain Water Supply

A busy farmer who depends on wind power to pump water for his stock rigged up an automatic device, as shown in the sketch, to regulate the windmill. By this means the pump is automatically brought into action, or shut off, when the water tank is in need of filling, or filled. A 5-gal. can with a small hole in the bottom was hung on the end of a 4-ft. horizontal lever, which is attached to the wire controlling the fan of the windmill. The overflow pipe of the storage tank was lengthened with garden hose so that its outlet was above the can. When the tank is full, the overflow fills the can and this weight turns off the windmill, stopping the pump. In 15 or 20 minutes a portion of the water leaks out

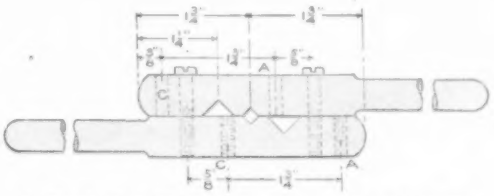


This Device for Regulating a Windmill Does Its Work Automatically

of the can, and the weight being reduced, the mill again comes into operation. However, if the cattle have meanwhile lowered the water level in the trough, which is automatically refilled from the storage tank, the mill continues to pump until the tank is full.—F. E. Tuck, Nevada City, Calif.

Tap Wrench Fits Various Sizes of Shanks

This tap wrench was made to take the place of different-sized wrenches. The sketch shows it assembled for small taps, less than ⅜ in. The other notches are used on taps larger than ⅜ in. The wrench gives more leverage with the larger taps, by shifting the handles to the proper notch positions. Both ends are the same. To match the large notches, holes A and C in the upper piece are matched

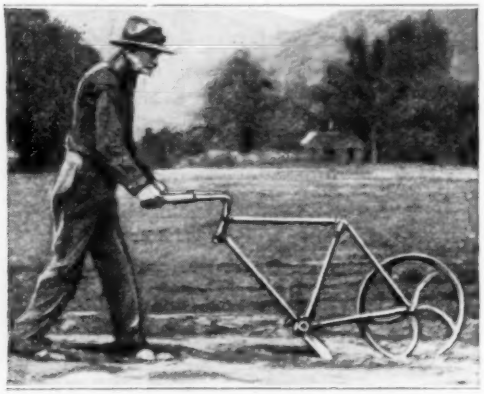


A Single Tap Wrench Does the Work of Several by Reason of the Double Notches

against holes A and C in the lower piece.—Clarence H. Anderson, Worcester, Mass.

Hand Plow Rigged in Bicycle Frame

An old bicycle frame was easily converted into a substantial frame for a

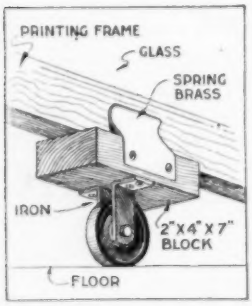


This Hand Plow was Rigged Up from an Old Bicycle Frame, an Iron Wheel, and a Section of a Shovel for the Plowshare

hand plow, as shown in the photograph, the handlebars being reversed, and used as plow handles. An old iron wheel was fitted into the frame where the rear wheel formerly was set, and the plowshare, shaped from a section of an old shovel, was bolted to the hub at the usual crankshaft bearing. A U-bolt of round iron was used for this purpose.—Robert W. Phelps, Los Angeles, Calif.

Detachable Caster for Heavy Blueprint Frame

It is hard to handle a large blueprint frame, in moving it out into the light and back into the print-washing room, without undue exertion and danger of breaking it. A handy method of transporting the frame is on a roller caster, suitably fitted with a block and side clips of spring brass, as shown in the sketch. The caster is slipped onto the bottom of the frame and grips just tightly enough to hold well in transit.

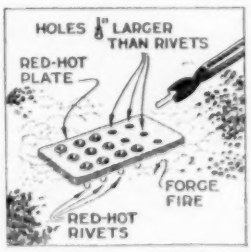


Breaking Porcelain Tubes Squarely

A good way to break porcelain tubes used in electrical work is as follows: Bore a hole through a timber, or block, so that the barrel of the tube will fit quite snugly into it. Insert the tube in the hole, and let the portion to be broken off extend beyond the face of the block. Strike the projecting end of the tube a sharp blow with the hand, or with a soft mallet, and it will break just even with the face of the block.

Handy Method of Heating Rivets in Forge Fire

The common method of heating rivets in a forge fire is to toss them into the coals and then withdraw the rivets individually when they are hot. This is an awkward procedure, and the method shown in the sketch is much better. Holes for the rivets are drilled in an iron plate which is heated before the rivets are inserted. The plate with the rivets is then packed in the fire and the entire arrangement withdrawn easily when the rivets are heated as desired. The plate can then be immediately refilled and a new batch of rivets heated.



Small Drains in Concrete Made with Pipes

Where it is necessary to make drainage grooves in concrete before it has become hardened, a neat groove of uniform size and shape may be provided by using a length of iron pipe of the proper diameter as a form. The pipe is partly imbedded, and removed carefully. If it is necessary to refinish the groove, a short section of pipe, smoothed to a polish and rounded up at the ends, makes a good improvised surfacer.

Apparatus for Locating Trouble in Aerial Telephone Cables

By A. J. VIKEN

CONSIDERABLE damage to aerial telephone cables is often caused by lightning burning off insulation on cable pairs, resulting in crossed wires, short circuits, and grounded pairs. To locate trouble of this nature, a home-made instrument was used with success, and the necessary repairs made to damaged cable pairs.

The chief parts, as shown in Fig. 1, are four dry cells, an induction coil, a buzzer, and a switch. The diagram shows the method of wiring. Three of the cells are wired through the primary windings of the induction coil B, and through the buzzer C, which serves to make and break the current. One side of the three dry cells in series is connected to one of the primary wires on the induction coil, at A. The other side is connected to the vibrating spring D on the buzzer. If the works from a doorbell are used as a buzzer, remove the gong, cut off the hammer, and bend the shank into shape, as

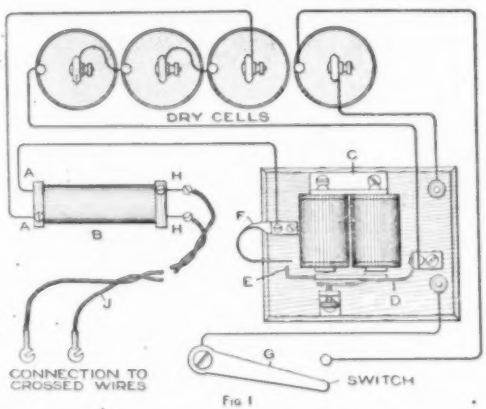
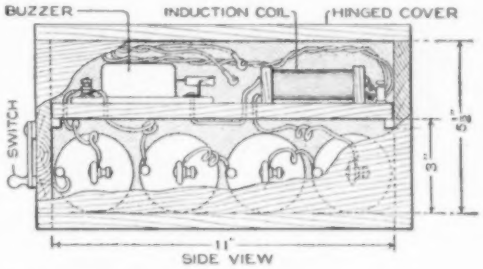


Fig 1

General Arrangement of the Testing Apparatus, Showing the Connections of the Induction Coil B, the Dry Cells, and the Buzzer C, the Circuit being Controlled at the Switch

shown at E. The point must be filed sharp. If a buzzer is used, solder a piece of wire to the spring, to take the place of the shank. A brass spring, F, is fastened in place with screws and adjusted so the point E will strike it and make a perfect contact at every movement, when the buzzer is started. The spring F is connected to the other end of the primary windings of the



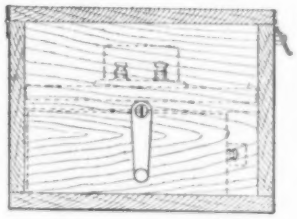


Fig. 2

The Outfit is Inclosed Compactly in a Wooden Box so That It Is Readily Portable, Yet Properly Protected

induction coil B. The buzzer is run by the fourth cell, which is connected to the binding posts in the ordinary way. A switch, G, is cut in on one side. The secondary windings of the induction coil are connected to two binding posts, at H, to which cords J are attached. These cords are used to connect the instrument with the cable pairs to be tested. The apparatus was arranged in a wooden box, as shown in Fig. 2.

Several typical cable troubles are shown in Fig. 3: Pair O is short-circuited; two lines of pairs P and Q are crossed, and line 4 of pair S is grounded on the cover. To test damaged cable pairs the lineman goes to the cable terminal and with his telephone test set locates the crossed wires. The testing instrument is then connected with the two crossed wires by the cords J, and the buzzer is started by

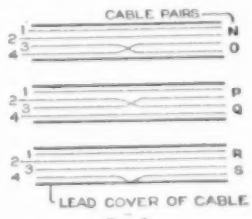


Fig 3

closing the switch G. A series of electric waves will pass through the loop formed by the crossed wires. The extreme end of the loop is at the point where the wires are crossed. The waves will travel to this point and back to the instrument at the cable terminal. By transforming these waves into sound, the end of the loop—the place of trouble—can be located within 1 in. For this purpose two telephone receivers are used, as shown in Fig. 4. A head strap permits use of both hands.

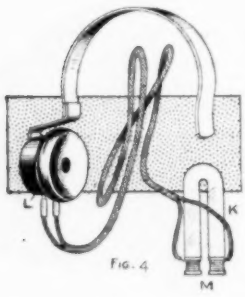


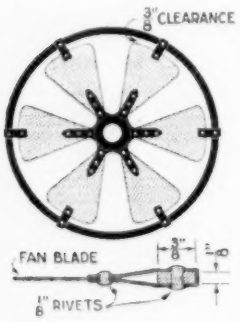
FIG. 4

The magnet and coils K are removed from a receiver of the type used on desk telephones, and connected by a cord with a small receiver, L, which has a head band. To detect the waves passing through the cable, the receiver L is placed to the ear, and the magnet, with coils K, is held with the ends M touching the lead cover of the cable. If the listener is between the cable terminal and the place of trouble, a buzzing sound will be heard. By moving away from the terminal, a span at a time, the trouble will soon be located between two poles, as the sound will not be heard when the listener is beyond the end of the loop where the trouble is.

By the use of a cable car, the listener can travel slowly over the span and locate the exact spot where the wires are crossed. The cable can then be opened and repairs made. If testing over a long stretch of cable, it may be necessary to use more than three cells with the induction coil to make up for the additional resistance in a long loop. A small storage cell will also meet this requirement.

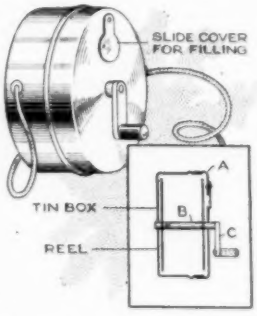
Rim Reinforces Cooling Fan

A kink that was used on an automobile cooling fan of the familiar design, in which the blades are riveted to small projections cast integral with the fan hub proper, will be of interest to autoists and others who repair cars. The blades continually became loose and bent because they were not held firmly enough. A ring of cold-drawn rod, ⅜ by ⅛ in. in cross section, was made, the diameter being sufficient to clear the fan blades by at least ⅜ in., as indicated. The ring was riveted to the six blades by means of strips of metal, 1/16 by ⅜ in. in cross section, and ⅛-in. round-head rivets. This made the fan rigid, and no further trouble was experienced with it.



A Self-Chalking Chalk Line and Reel

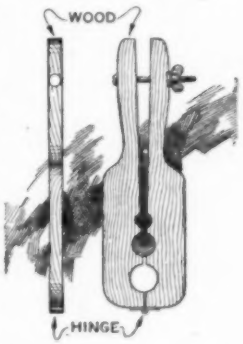
A tin box with a tightly fitting cover was made into a useful reel case and automatic chalking device for a chalk line, as shown in the illustration. The box used was 4 in. in diameter and 2 in. deep. The line is wound on a rod, B, which is provided with two side disks as guides for the line. The shaft is set in the bottom and the cover of the box, and provided with a handle, C, as shown. An eyelet is set in the can where the line is drawn out. If the cover is very tight-fitting, it may be used to get at the interior of the box. Otherwise, a small slide cover of spring brass may be fitted over a hole in the top, and the cover soldered at the joint A. The spring cover should



be made with a slight dish effect so as to fit the hole snugly.—R. B. Hayward, Keene, N. H.

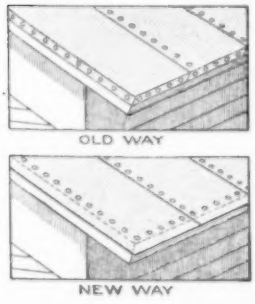
Tool for Holding Polished Metal Parts in Machine Operations

It is sometimes necessary to drill holes in highly polished metal parts, or those having threads on the outside surface. To hold such parts in a vise, a wooden holder should be made, as shown, suitable for several sizes. The holder consists of two strips of wood, shaped, and hinged together. The free ends have a bolt through them tightened with a wing nut. The holder may be held tight by pressure of the handles on light work, and the grooves shaped to suit special jobs.



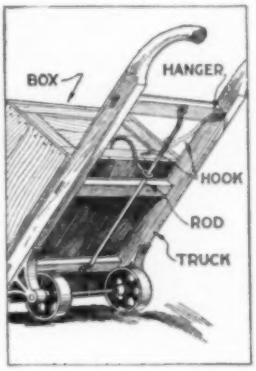
Overhanging Edge on Roofing Found Superior

In putting on roofing, of the sheet or prepared kind, I have found that better wear is given and as good protection also, by setting the roofing so that it has an overhang at the edges of the roof instead of being nailed solidly along the edges. When the roofing material is folded over, as indicated, the nails are usually driven into the edges of the board. This allows water to creep in around the nails and affects their holding qualities, as well as deteriorates the roofing material. The overhang causes the water to be thrown clear of the edge.—T. J. Hubbard, Mendota, Ill.



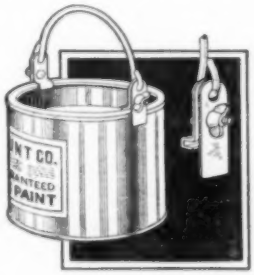
Hook Fitted to Hand Truck Holds Boxes

By fitting an ordinary hand truck, of the two-wheel type, with a hook which grasps the box or other load, preventing it from falling forward, the trucker may not only save time but also prevent damage to the load or to fellow workmen. The hook is shaped of wrought iron and slides on a rod, as shown. The rod is flattened at the ends and fastened to the crossbars of the truck with screws. The hook is thus adjustable to boxes of various sizes.—R. B. Glenn, Atlanta, Ga.



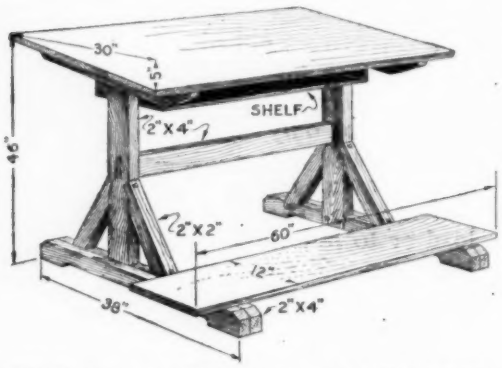
Detachable Handle Convenient for Paint Buckets

By the use of a simple handle fitting, which can be attached to an ordinary can or bucket, a convenient receptacle for paint, whitewash, or other materials, can be provided. The clamping device, to which the bail is attached, consists of two pieces of strap iron, shaped as shown, and bolted together with a stove bolt and wing nut. The inner piece is bent to grasp the edge of the can, and the grip is made firm by tightening the wing nut. The handle can be sprung sufficiently to accommodate it to cans within a reasonable range. A good kink is to provide several sizes of handles, if sufficient use is found for the device.—Bert Waychoff, Fort Collins, Colorado.



Strong and Inexpensive Desk Made for Shop Use

In a shop where a number of desks for various uses—clerical, drafting, and



This Design for a Shop Desk was Adopted Where the Requirements Varied from Clerical Work to Drafting

other work—were needed, a standard design of the type shown was adopted and made in considerable number. Two by four-inch stock was used for the main parts of the frame which were strongly braced. The top was slanted down toward the front 5 in. in the width of 30 in. across the top. The footboard was found desirable because of the nature of the shop floors. The desk is high enough for a workman standing, or for drafting or other work when seated on a high stool. The shelf provides for books, tools, and other accessories.—E. R. Garfield, New York, N. Y.

Eyelets Handy in Lacing Holes of Light Belts

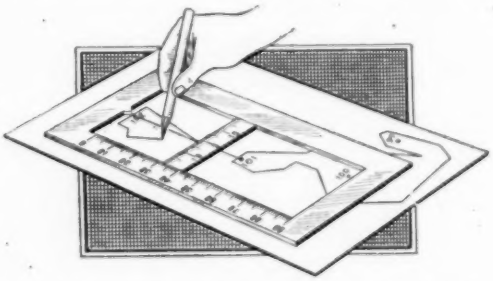
On small machine belts, especially where lacing must be done with no shop equipment at hand, eyelets are handy in the lacing holes. Belts on automobile fans, for example, become worn, and the lace pulls the holes out so that the belt has to be taken off, cut, and readjusted, sometimes on the road. I took my auto belt to a shoemaker and had him place a shoe eyelet in each of the holes, strengthening it as well as making repairs easy.—C. H. Thomas, Kennett Square, Pa.

Small Bolts Locked Quickly by Cutting with Chisel

Sheet-metal workers make many fastenings with small stove bolts, especially in work on ventilating systems. The nuts usually fit loosely, and to lock the bolts to them, the projecting end of the bolt is nicked with a cold chisel at the outer face of the nut. With several blows of the hammer, the end is broken off. The burring of the thread and the slight bending of the bolt end make an effective lock, preventing the nut from coming loose.—Walter M. Gill, Louisville, Ky.

Device for Mapping Surveyor's Data

A simple and timesaving device for mapping survey notes consists of a metal frame, graduated for longitudinal measurements, and a sliding scale, for offset distances, as shown in the sketch. The rectangular frame is made of sheet iron, the scale along the edge being glued on, or stamped. The sliding scale can be readily made from an old celluloid triangle, and must fit closely and squarely. To set the scales for mapping a series of indications from a station, the center point at the top of the hollow rectangle, which is directly opposite the zero of the longitudinal scale, is set over one transit point, and the zero of the sliding scale over the other. The edge of the sliding



The Surveyor's Data are Mapped Quickly and Accurately by the Use of This Frame and Scale

scale will then always be at right angles to the surveyor's base line for the data being mapped.

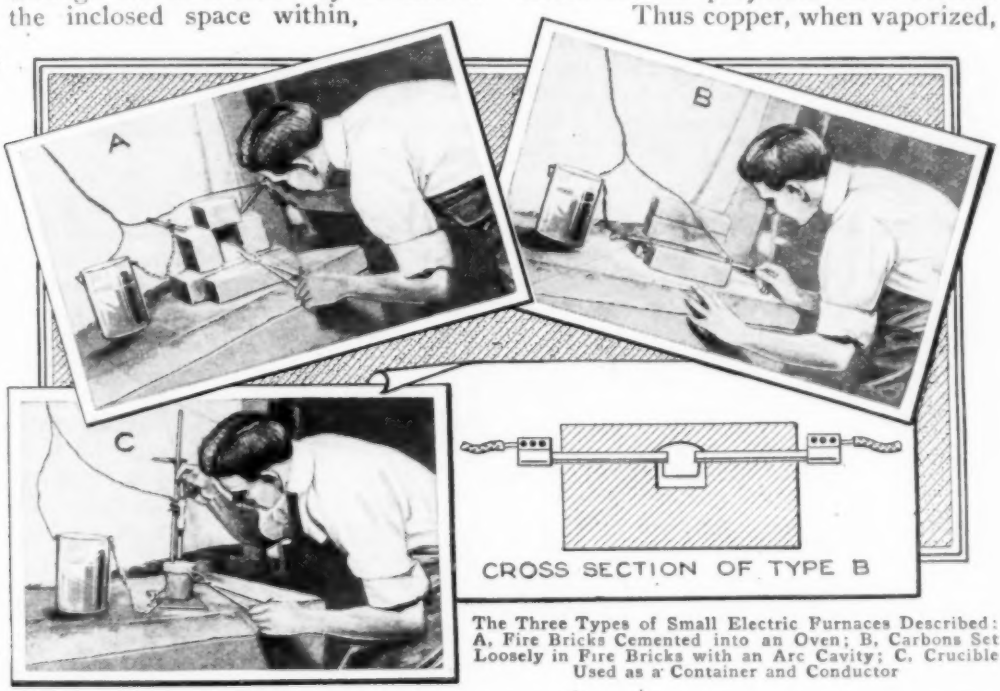
Small Electric Furnaces for Shop or Laboratory

By W. M. MILLS

An adaptation of the electric furnace, commonly used in experimental and other work, can be built for use in the small shop or laboratory, and successfully operated for such service. The current used may be direct or alternating, accumulation of heat being the essential. Three types of furnaces of simple and inexpensive construction, for various conditions, are described in this article, and shown in use in the photographs.

Type A, as shown, consists of several fire bricks arranged and cemented in an oven shape, with an opening through which access may be had to the inclosed space within, where the arc is produced. Two long carbon sticks pass through from the sides, and are adjusted so as to produce the best arc. The opening of the furnace can be screened during operation by a mica sheet, or amber-colored glass plate, to shield the eyes from the powerful light. In ordinary work, a current of 30 amperes and 110 volts was found sufficient, although more than this is necessary when working with refractory substances. A rheostat, or other suitable resistance, can be arranged to control the current. One of the type used with a stereopticon lantern proved satisfactory.

When ready to begin operations, one of the carbons is lowered slowly until the arc plays, and the front screen is placed in position. Considerable heat is soon generated in the oven. Common metals can be melted, and even boiled. Powdered rocks and minerals with some fluxes can readily be melted down. Quite a list of materials can even be vaporized, and, by the use of a focusing lens, their characteristic colors can be projected on a screen. Thus copper, when vaporized, gives a blue-green color, and other metals are similarly distinguished. The entire heating process can also be thus viewed.



The Three Types of Small Electric Furnaces Described: A, Fire Bricks Cemented into an Oven; B, Carbons Set Loosely in Fire Bricks with an Arc Cavity; C, Crucible Used as a Container and Conductor

The type B furnace consists of two fire bricks laid one on the other and provided with grooves, in which two long carbons are fitted, and wired as detailed. In the center of the bricks, on the inside, there is hollowed out a small square cavity, and in this the ends of the carbons are adjusted to

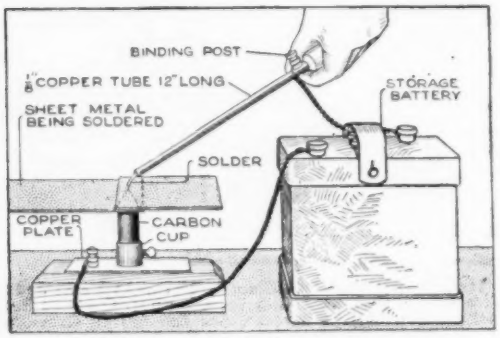
form the arc. In this cavity are placed the materials through which the arc plays. The seams where the surfaces of the bricks meet may be cemented, if necessary, but the adjustment of the carbons in their grooves must be loose to permit the gases generated to escape. As these gases are not always nonpoisonous, the usual precautions against inhaling them should be taken. A hole through the upper brick can be cut to allow the operator to view the action within the cavity. This opening is covered with a mica sheet. The cover can be removed, and the materials within adjusted, if desired. This type of furnace produces a much greater heat than type A.

The third type of furnace, C, is an arrangement where the cathode, or negative pole, is made up of a graphite crucible in which the material in work, reduced to a powder, is packed. The wire carrying the current is attached to the outside of the crucible, as shown, and the usual resistance provided.

A few suggestions as to possible uses of these furnaces are valuable: The less volatile and refractory metals and compounds, such as lead, zinc, etc., quickly melt, oxidize, and volatilize in the heat of these furnaces. Copper, iron, gold, and even platinum soon melt and come to a boiling point. Their vapors then pass off and upon examination, when the furnace is cooled off, their crystals will be found on the surfaces of the oven. Some of these are beautiful, especially those of gold. Quicklime may be produced easily in the furnace by permitting the arc to play on a piece of marble. The quicklime may be then tested by adding water to it, and the heat given off will show its nature.

Soldering Electrically without an Iron

Electrical soldering, based on the principle of spot welding, is both



The Solder Point is Heated When a Contact is Made, Completing the Electrical Circuit

economical and efficient. Electric energy is used only during the interval of soldering, thus insuring low cost; and the device is also ready for instant use. A simple outfit, as shown, consists first of a short length of arc-light carbon, tapered at one end, while the other end is fitted into a copper cup, in which it is tightly held by a set screw. The copper cup can easily be formed by hand from a short strip, 1 in. wide and 3/32 in. thick, made into a ring. The ring is soldered to a copper plate which forms the bottom of the cup, and serves also as a support. The plate is fastened with screws to a wooden base. Next procure a copper tube, 12 in. long, and 1/8 in. inside diameter. Fit one end of the tube into a wooden handle. Binding posts, as shown, are set on the copper plate and on the tube, and these posts connected to a six or eight-volt storage battery. The outfit is then complete.

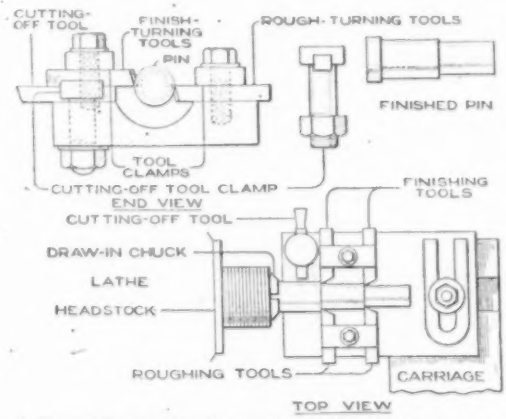
Before starting work, a 6-in. length of string solder is placed in the tube, leaving an inch or so projecting from the end. Place the metal sheets to be soldered on the carbon tip, as shown. Then touch the end of the solder to the sheets directly above the carbon electrode at the point to receive the solder. Immediately the carbon will glow, heating the metal sheets, which in turn melt the solder, permitting it to flow on smoothly, and in the desired quantity. The instant the solder string is removed from the sheets, the electrical contact is broken and the carbon point cools.—K. M. Coggeshall, Webster Groves, Mo.

Hanging Oilcan Handy for Overhead Work

When oiling machinery that can be reached only by standing on a ladder, it will be found more convenient to hang up the oilcan than to set it down where it is in danger of tipping over. It is only necessary to solder a brass ring to the oilcan stem near its end. The ring can then be hung over a hook on the ladder, or on the machinery.

Tool Block for Making Small Pins on Lathe

Having some small pins to turn and no turret lathe I made the tool block shown in the sketch. The stock of which the pins were made was cold-rolled machine steel. It was held in the draw chuck of one of our engine lathes. A block of cast iron was shaped up and drilled, and the tools mounted upon it, as indicated, the tools being held by clamps and cap screws. The graduated dial was run to zero, and the tools were set from a previously turned model, each set of tools taking the same amount of cut, the finishers taking as much as the roughers. When a cut was finished the carriage was run in a few thousandths of an inch and run back. The cutting-off tool was

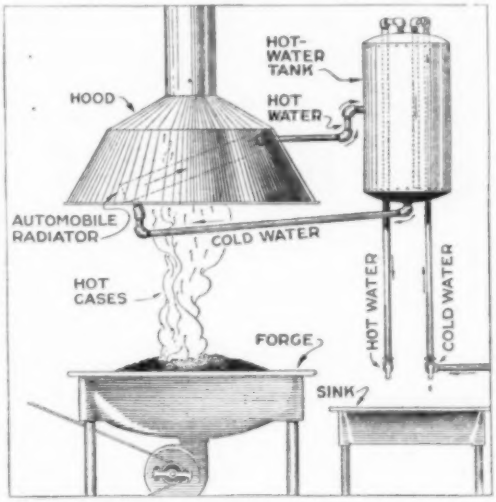


A Turret Lathe Not Being Available, the Pins were Quickly Made by the Use of This Special Lathe Fixture

then brought into play, cutting off the stock and facing off the end.—Joe V. Romig, Allentown, Pa.

Old Auto Radiator Converted into Shop Water Heater

By reversing the work done by an automobile radiator, which was no longer fit for service as such, a blacksmith provided himself with a hot-

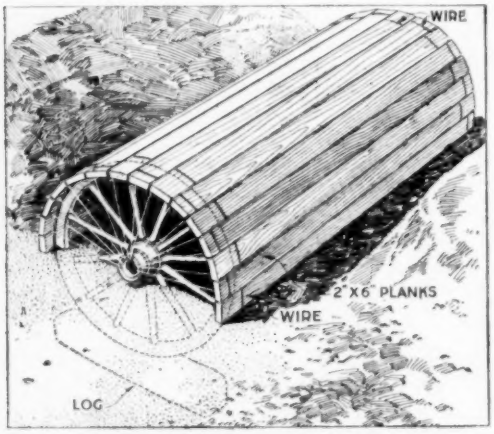


An Old Auto Radiator was Utilized to Provide a Water Heater for the Workshop by Conserving the Heat Above the Forge

water supply, which he appreciated especially in washing up after a hard day's work. In the arrangement which he devised, as shown in the illustration, the water circulating within the radiator is heated by the hot gases and air above the forge. The hot water is piped to a conveniently located storage tank. The method of arranging the pipe to provide for a cold-water supply and a hot-water delivery system is shown, the arrows indicating the direction of flow. The radiator is supported at an angle in the hood of the forge. The vent in the radiator is soldered, and the filler opening provided with a wiped joint, to which the ½-in. iron pipe, used to make the connection to the halfway point on the side of the 6-gal. tank, is attached. The heated water is taken from the top of the tank, and the cold water enters by means of a pipe extending through the top and down inside the tank to the bottom. Heat otherwise lost is thus conserved. —E. F. Hallock, Brooklyn, N. Y.

Wagon Wheels Provide Forms for Concrete Culverts

In constructing a concrete culvert several old wagon wheels, of uniform size, were put to good use as supports for the form over which the concrete



By the Use of Old Wagon Wheels Wired to the Planks Which Supported the Concrete for a Culvert, They are Easily Recovered for Further Use

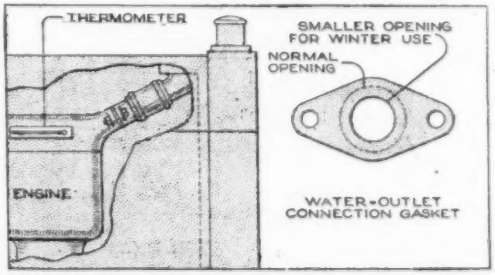
was laid. The wagon wheels were set on logs, or planks, which could easily be removed, thus dropping the wheels from their position under the forms. The planking, of 2 by 6-in. stuff, was wired to the wheels, by passing the wire around the planks and the hubs, as shown. The wires were easily cut in removing the wheels, and the planking was likewise easily withdrawn. Both the wheels and the planking could be used again.—Robert C. Knox, Arcadia, Fla.

Square-Point Center Punch Handy for Revising Marks

In laying out work in the machine shop, or other metal-working shops, it is customary to indicate centers and other points by means of center-punch marks. The punch is usually ground to a conical point, and it is difficult to distinguish various groups of markings, and especially revisions. A practical kink in this connection is to use a special punch for making revisions, or for indicating certain kinds of marks, the punch being ground to a square pyramid at the point. Triangular or other points may also be used if several different marks are desirable.—Edward M. Davis, Philadelphia, Pa.

Auto Radiator Water Gasket Altered for Winter Operation

Motorists realize the necessity of covering the radiator and hood of an automobile in the winter months, because the rapid radiation of the heat results in inefficient operation. A thermostatic valve set in the outflow pipe of the water system is used in many motors for cold weather. A simple change in the gasket at the outflow pipe, connecting the water jackets to the radiator, is nearly as effective as the thermostatic valve. It has an advantage in saving the nonfreezing solution, commonly employed, from rapidly boiling away, as often happens where the radiator is covered and maintained in a heated condition. The change in the gasket is merely in the substitution of one having a smaller opening. A gasket of one-half the normal area was used on a 22-hp. motor with excellent results. The proper size for the engine on which it is to be used can be best determined by experimenting, a gasket with a small opening being first set into the outlet water connection. A thermometer of the type used for vulcanizing rubber is placed on the cylinder head. If this records over 180° with the engine running rapidly, the gasket should be removed and the opening enlarged.



By Providing a Gasket with a Smaller Opening, the Radiator System is Operated Economically in Cold Weather

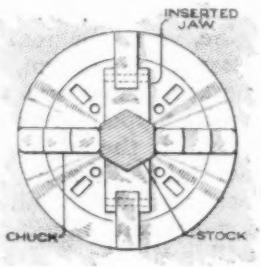
When the proper-size opening is secured, the radiator is relatively cool.

Worn Loose Pulleys Replaced by Adjoining Set Pulleys

Much noise was caused in a small machine and pattern shop by the pounding of loose pulleys on the countershaft, the bore in the hubs being worn slightly oval. The set pulleys were removed and put in place of the worn loose pulleys. The latter were then set on the shafts in place of the old set pulleys. The noise and undue wear on the shafting was thus overcome.—J. C. Hansen, Chicago, Ill.

Jaws for Holding Hexagonal Stock in Chuck

In machining hexagonal stock in a four-jaw chuck, trouble is usually experienced in centering the work. Under these conditions, special jaws like those shown in the sketch were made, and proved effective. By their use, it was only necessary to set the hexagonal stock into place and to adjust it in the usual manner. The inserted jaws are held against the chuck jaws by means of headless set screws.—C. H. Andrews, Boston, Mass.

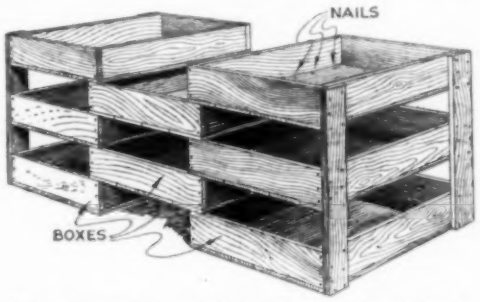


Roofing Paper as Packing for Pumps and Fittings

It is a common practice to use leather for packing union joints, pipe flanges, pumps, and similar fittings. The present scarcity and high price of leather makes a substitute especially desirable. It has been found that a good grade of three-ply felt roofing paper affords an excellent substitute for leather packing, and lasts a considerable time. The holes in the packing should be cut a trifle large, as the paper has a tendency to swell.

Stock Bins Built Up from Boxes as Units

Boxes of various sizes may be joined into series of stock bins, if the boxes

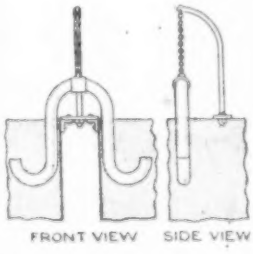


The Boxes are Arranged in Tiers to Form Handy Stock Bins. More Rows may be Added as Desired

are sorted and those of the same dimensions joined together as shown. The boxes are nailed together in tiers, with short nails through the bottoms, where the edges overlap. The end tiers are supported by strips nailed at the corners. A convenient method is to build up the boxes into standard sections, of about the size indicated, and then to place these sections as required.

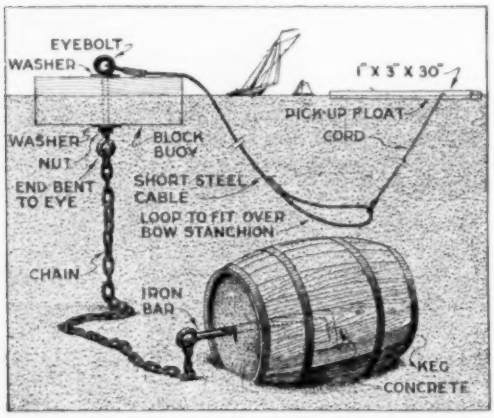
A Siphon That is Easily Kept Primed

A ready-primed siphon can be made by bending a piece of pipe into the shape shown in the illustration. After being once filled, the water, or other liquid, remains in the pipe as long as the outlets are level. It is preferable to balance the pipe by means of a chain, as shown, and connect it with a collar on the pipe, for adjustment. This method of siphoning provides a temporary means of connecting two adjacent tanks, and is useful for many other purposes where the flow is irregular and personal attention unavailable.—A. W. Allen, New York, N. Y.



A Substantial Float Mooring for Small Boats

Confronted with a job of making a permanent mooring and anchor for deep water in a tidal river, a boat owner made one that withstood severe weather by the method shown in the illustration. A keg was filled with concrete in which an iron bar shaped into an eye at one end and bent at the other, as indicated, was imbedded. The float was made of a large block, and the connecting chain fastened to a heavy double eyebolt bolted through



This Mooring for a Small Boat Anchored by Means of a Keg Filled with Concrete is Desirable Where Waves Are Choppy

it before the lower eye was shaped. A short steel cable, having a loop to fit over the bow stanchion of the craft, was fastened to the surface eyebolt of the float. A small pick-up float was attached to the loop of the cable, as shown, for convenience in running up to the buoy.—B. Francis Dashiell, Dunkirk, Md.

Testing Compression in Cylinders of Automobile Motor

Automobile engines usually lose compression after considerable wear, and the charge in the cylinders is retained with more or less leakage. The causes are, in the common order of their occurrence: leakages through the spark-plug and valve-cap joints; leakage through exhaust valves, and leakage past the piston rings. If each cylinder lost compression in equal degree, the results would be only loss of power and increased gasoline consumption, but this is seldom the case. In any engine in which there is loss of compression, some one cylinder will be found to lose its charge more rapidly than the others. Because of the resulting unequal pressure exerted by the pistons upon the rotating members, the engine vibrates, pounds under a heavy load, and develops noisiness in the valve motion. These conditions should be remedied promptly.

The usual method of testing compression is to turn the engine over, against compression, by means of the cranking handle, noting the resistance offered by each cylinder. A much better method is to run the machine part way up a moderately steep, smooth-surfaced grade, stop the car and engine, set the engine into reverse, engage the clutch, and, releasing the brakes, allow the car to back down until stopped by the cylinder compression. If the compression in the cylinder taking the load is approximately perfect, the car will remain motionless for several minutes; if not, the car will settle back against the compression stroke in the next cylinder more quickly, relative to the leakage.

The identity of the cylinder under compression can be determined by testing with the priming cocks, and once the order of compression is found, a continuance of the backing experiment will determine very accurately the relative compression in each cylinder. Cylinder oil squirted around spark-plug and valve-cap joints betrays leakage by foaming. The condition of the exhaust valves can be discovered by inspection. When the joints and valves are tight, continued loss of compression indicates leakage past the piston rings, possibly resulting from lack of lubrication, sticking, or distortion of the rings caused by deposits of carbon. Excessive heating of the motor base also indicates leakage past the piston rings.—Hayes Bigelow, Brattleboro, Vt.

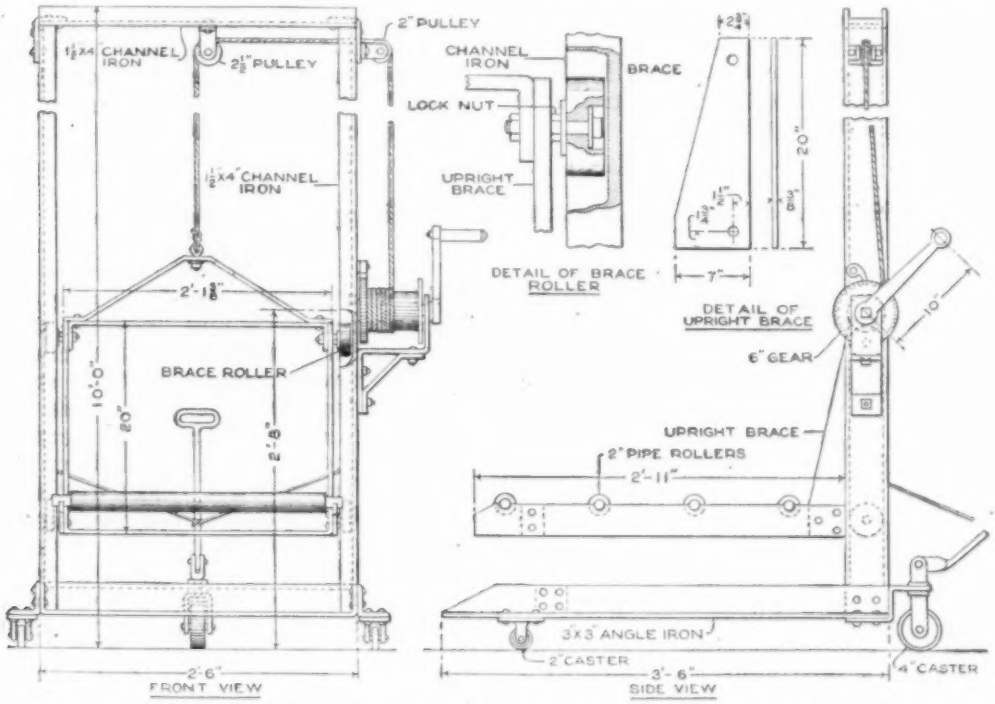
Winch Truck for Piling and Loading Boxes

By P. P. AVERY

IN a warehouse where many cases of goods were piled 10 or 12 ft. high, it was found desirable to devise a mechanical means of raising the boxes to the top of the piles. An elevator arrangement, which is described as a "winch truck," was built for the purpose, as shown in the illustration and the working drawings, and proved a great time and work saver. The boxes are originally piled on wooden platforms, built over 2 by 4-in. frames, the platforms being set across supports, raising them from the floor so that the winch-truck carriage can be run under them. By raising the platform of the truck slightly, by means of the drum and crank device, the entire pile of boxes is lifted, with their supporting platform, and then transported to the new location. At this point, the carriage with its load is raised, as desired. The upper boxes are removed and stacked on the pile. The truck may also be used in unloading, from a vehicle or from a pile of boxes or other similar containers, the general process, of course, being reversed. The winch truck is substantially built, and the design, shown in detail, is for boxes or crates of ordinary size. The dimensions may be varied, using the same general design, to suit the truck for the handling of smaller or somewhat larger boxes or containers.

The main vertical frame is built up of 1½ by 4-in. channel iron riveted at the joints. The channel iron is set with the channel inward, so that the carriage is guided in the channels, by means of rollers bolted to the sides of the carriage, as shown in the front and side views, and in the detail of the brace roller.

The floor truck proper is built up of 3 by 3-in. angle iron, and is carried on 2-in. casters and a 4-in. caster mounted with a fork and a handle, for pulling



By the Use of This Winch Truck, Boxes or Similar Containers can be Piled, or Taken Down from a Pile or a Load, with a Minimum of Labor and at a Considerable Saving of Time

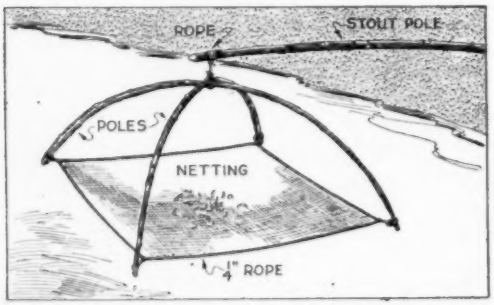
the truck and guiding it, as shown. The bearing above the large caster is heavily reinforced with a plate of iron, bent to the shape shown in the side view, and riveted to the lower truck frame. The main upright frame is riveted to the lower truck frame, and may be suitably braced to it, if the boxes to be lifted are quite heavy.

The winch drum and crank arrangement is shown in the front and side views, and is of the usual geared type. A single gear with a pawl may be used for handling comparatively light loads, or a train of gears may be used for heavier loads with a stronger framework. The pulley arrangement for conducting the cable to the load is clearly shown, the pulleys being carried between angle supports.

The truck carriage, which supports the load, is shown slightly raised from the lower frame. It is strongly built of iron bars, into the upper edges of which 2-in. pipe rollers are set, as shown. These rollers are handy in placing the boxes on the carriage, or in removing them. The carriage is braced to its upper framework by upright braces, made as detailed, and riveted into place. These braces carry the brace rollers, which are guided in the channel irons of the main frame. The method of fastening the other parts of the carriage is shown in the front view. The metal parts, other than the bearings, should be given a coat of red lead when the work is assembled, and later suitably painted. The working parts should be properly greased.

Large Minnow Net Made of Branches and Netting

The fisherman who does not care to take extensive equipment with him on



The Rigging for This Homemade Minnow Net is Quickly Arranged at the Fishing Spot

a trip often has need of an efficient means of catching minnows, especially in places where it is difficult to wade and make use of an ordinary minnow net. A handy way to arrange the net is to attach it to branches, cut on the spot, the poles being lashed together, as shown in the sketch. The net is reinforced at the edges with rope, and fitted with ropes for tying it at the corners. The net rigging is supported from a stout pole, making it convenient to use the outfit even from a high bank.

Scraping Babbitt Bearings to a Nice Fit

After a babbitt-metal bearing has been poured in the box, using the shaft as a core or mold, it should be scraped so that it will accurately fit the shaft. A good tool for this purpose is one homemade of triangular cross section, like a three-cornered file without the teeth. If such a tool is not available, one may be improvised by grinding the teeth from such an old file with an emery wheel. The ground faces should be honed smooth. The scraping is done with the edges, which must be sharp.

In use, the portion of the shaft which is to rotate in the babbitted bearing is given a thin coat of lampblack, or Prussian-blue oil paint. The painted shaft is placed in the bearing and turned by hand a few rotations and removed. At the points where the shaft contacts with the bearing metal, paint from the shaft will be left on the babbitt. These spots are scraped with the tool. The shaft is again painted and rotated, and the high spots scraped off. The process is continued until the paint is found to be evenly distributed over the entire surface of the bearing. The shaft should have

a good "running fit" but without sufficient play to permit knocking.—Frank R. Cameron, Chicago, Ill.

Ankle Strains in Driving Auto Relieved by Heel Block

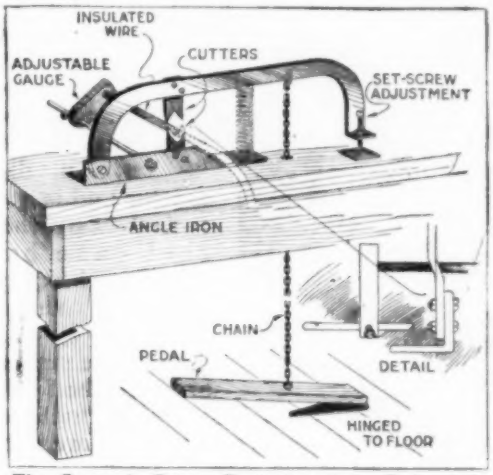
Leg and ankle strains, attending the operation of a foot throttle in driving an automobile, may be effectively reduced by the installation of an angular block to serve as a foot rest. The block is bolted to the floor, with the bolt heads countersunk, and notched to form a socket for the heel. The angle of slope up toward the throttle should be such that the sole of the shoe rests flat on the block, when the accelerator is completely depressed.—A. L. Payne, Garfield, N. J.

Large Jigs and Templates Painted Red for Identification

The annoyance of having large jigs and templates mistaken for commercial machine parts and being carted out of the shop was avoided, in a large plant, by giving them a coat of red paint. Because of their unwieldiness, these parts are ordinarily kept near the mechanics using them. The conspicuous red coloring identifies these special parts, and laborers are less likely to truck them away by error.—Joseph Plogmann, Cincinnati, Ohio.

Pedal-Control Wire-Stripping Bench Tool

A tool that will be found useful, in a shop where electrical wiring is done, is a wire stripper which can be set to remove uniform lengths of the covering from the wire. The outfit is fitted on the bench, or table, near the edge, as shown, and the wire is fed in between the cutters, against an adjustable gauge. The operator presses on the pedal and gives the wire a slight turn, so as to cut the covering all around. It may then be removed easily. The set-screw adjustment provides for cutting various sizes of wire. The detail construction of the cutters and gauge is shown at the right. The main frame is shaped from a strip of iron, and the cutters are of tool steel.

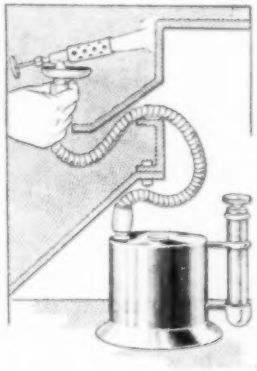


The Gauge is Set as Desired and the Ends of the Wire Thrust between the Cutters, Pressure being Applied on the Pedal

A coiled spring raises the cutter and frame, releasing the wire.—C. C. Spreen, Flint, Mich.

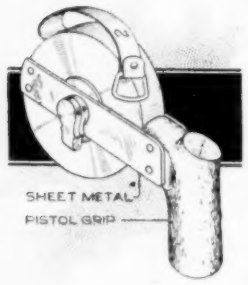
Blowtorch with Flexible Tube for Work in Close Spaces

In various kinds of repair work, especially on automobiles, brazing and soldering must be done in places where it is difficult to use a blowtorch of the ordinary type, unless it is adapted especially for the job. Under these circumstances, a blowtorch of the usual type was fitted with a flexible tube, as shown, the burner being fastened at one end of it. By this means the flame could be directed on spots which it would otherwise not reach. The tube is quickly disconnected and kept with the torch for convenient use.—Earl Botten, Boscobel, Wis.



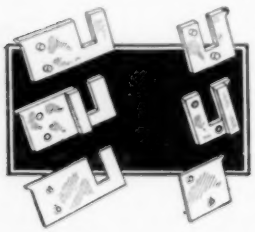
Homemade Pistol Grip for Surveyors' Tape

The tape commonly used by surveyors is hard to hold, especially when the hands are cold. The sketch shows a pistol grip that was cut from a tree branch. It measures about ¾ in. in diameter and is attached to the reel case by means of two strips of sheet metal, ⅝ in. wide. The strips are attached to the case by rivets, which pass through the rim of the case, so that they are not in the way of the tape. Two rivets secure the strips to the handle. The grip is especially handy in unwinding or rolling the tape.—F. H. Linthicum, Annapolis, Md.



Homemade Built-Up Liners for Linotype Machines

Having to set different bodies of type on the linotype machine, and being supplied with only one liner of the desired length, I made some liners which can be built up to various thicknesses, as required. I took a piece of brass rule of the desired thickness and length, and ground it down to the height of the mold. Two slight projections were then made in the surface of the strip to fit into two holes, bored in the liner as shown in the sketch. By building up with several strips of suitable length, various thicknesses are provided, saving the expense of buying special liners for each size of type desired.—Frank B. Waltrip, Hopkinsville, Ky.

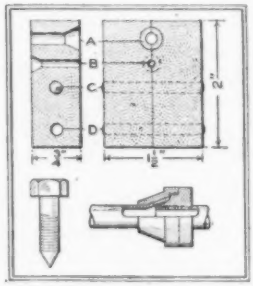


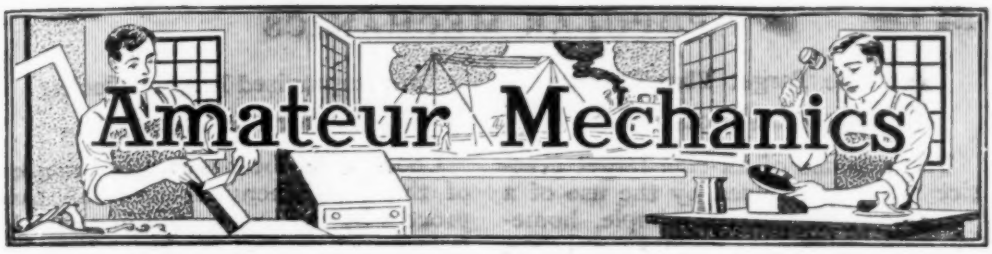
Support for Garage "Free-Air" Hose at Curbing

A convenient support for the "free-air" hose of a garage was fashioned from a piece of pipe, and set into the concrete of the street curbing. The main standard is a pipe set vertically, with two horizontal hooks fixed near the upper end, on the sides of the pipe, to hold the hose. The support prevents the hose from falling in the gutter, where it may be damaged by vehicles, and also attracts attention to the garage and its "free-air" service. The cost of this device is trivial when compared with the advertising it gives. —Jos. Thalheimer, Jr., Phoenix, Ariz.

Device for Making Bell Ends on Tubing

In making joints in brass and copper tubing, commonly used in oil and air-pipe lines, the sections are usually connected in a screw joint, or union, and one of the tube ends is formed into a "bell end." A tool for forming these bell ends uniformly and quickly is shown in the sketch. It consists of a metal plate, ¾ by 1½ by 2 in. in size, and provided with countersunk holes for two or more standard sizes of tubing. The tube is inserted in the die A or B, depending on the size, and clamped in place, with the end to be shaped just flush with the surface on the side which is countersunk. A machine bolt, ground to the proper point, is used to spread the tube end in the countersunk hole. Pins, C and D, hold the two sections of the die in place while it is being clamped. The plain end of the tubing is fitted into the bell end, as detailed. The bell end is removed from the die by releasing the pins C and D.—D. C. Goff, Kenosha, Wisconsin.



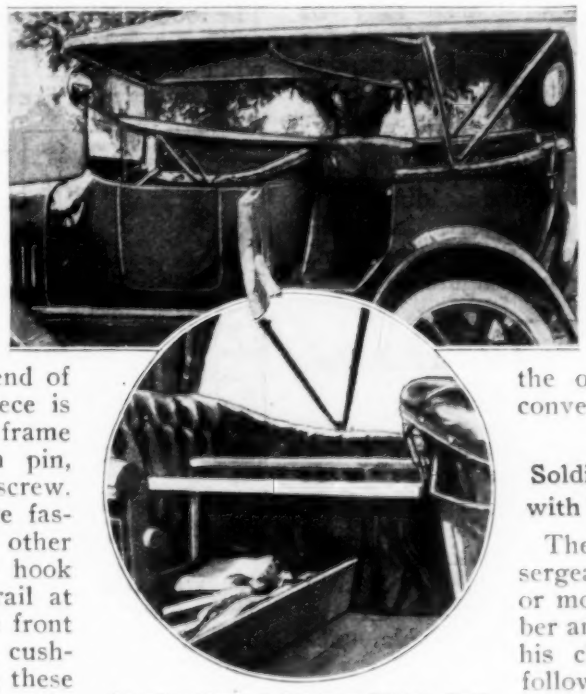


Auto Fitted to Provide a Comfortable Bed

By C. W. KIENLE

AN arrangement, by which the autoist is enabled to sleep comfortably in his car on tours or short trips, can be made in an hour, and requires only a few fittings that can be stowed in small space.

The outfit is shown installed in the photographs. Two supports are first made as shown of 1 by 2-in. wooden strips. They are arranged to fold at a hinge at the right angle; the lower end of each vertical piece is set into the seat frame with a wooden pin, or headless screw. Screw hooks are fastened into the other end, and these hook over the robe rail at the back of the front seat. The seat cushions are laid on these supports, forming the main part of the bed so that it is on a level with the top of the front seat. The supports should be set high enough so that the top of this seat is cleared nicely when the bed is in use. A piece of canvas of the required size is used as a cover, and is fastened to the top of the back seat with straps. Similar fastenings, as shown, are made on the windshield supports. The cushions carry the weight of the sleeper's body, and the forward portion of the canvas takes only the weight of the legs. This arrangement provides a comfortable lodging place on the road, and was found especially practical on summer outings and trips in rough country. The folding supports for the seat cushions are stored under the seat and the other fittings in convenient places.



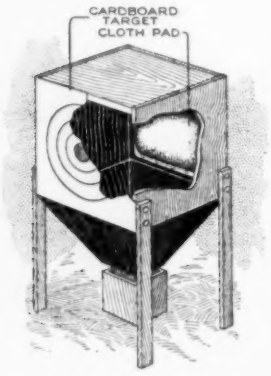
By the Use of Fittings Which Fold Compactly a Comfortable Auto Bed is Provided, as Shown Above and Detailed Below

Soldiers Dry Boots with Warm Sawdust

The quartermaster sergeant, having fifty or more pairs of rubber and other boots in his charge, uses the following method in drying them: Sufficient sawdust to fill the feet of the boots is warmed and poured into them. The sawdust absorbs the moisture quickly. If one filling does not dry the boots, the sawdust is heated again, and the feet filled once more. This method can, of course, be used for drying other footgear.—Eric Pope, Lieut. Canadian Engineers, on duty in France.

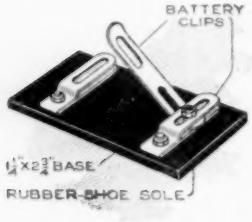
Air-Rifle Target That Catches the Shot

The expense of air-rifle target practice is much reduced by the use of a simple, home-made target that permits the same shot to be employed many times. It is also a convenient indoor target. A small packing box of any convenient size may be utilized for the purpose, lining the box on the bottom with strong cloth padding. Over the side of the box a paper or cardboard bull's-eye is tacked. The shot pass through the bull's-eye, strike the padding at the rear, and drop uninjured into the wooden funnel, and then into a small box below, to be used again.



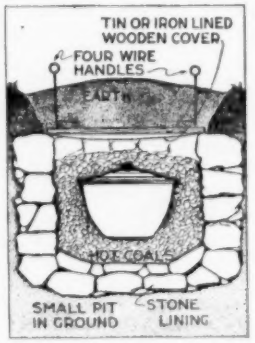
Battery Switch Made from Pick-Up Fittings

Requiring a small battery switch for temporary use and being unable to secure one, or the proper material to make it, without considerable delay, I quickly rigged up a serviceable substitute from "pick-ups" about the shop. The base is a piece of rubber-shoe sole; the terminals and the lever are clips taken from old dry cells. The terminals are secured to the base by binding posts, also taken from dry cells, and are fastened with nuts. The pivoted lever has considerable spring, which gives it a good contact.—T. H. L., Annapolis, Md.



An Improvised Fireless Cooker for the Camp

Cooking the beans, or other staples, of the camp menu becomes an easy process by the installation of a simple, improvised fireless cooker, as shown in the sketch. Such a cooker permits the preparation of a meal during the day without the necessity of some member of the party remaining in camp. A pit, 3 ft. square and 2 ft. deep, is dug in a high and dry portion of the camp site. The bottom and sides of the pit are lined with stones. Several boards are then nailed together, and covered with sheet iron, asbestos, or other fireproof material, to form a lid. The food to be cooked is brought to the boiling point on the fire, and meanwhile the cooker is made ready, by building a wood fire in the pit and permitting it to burn to glowing embers. The cooking utensil is quickly transferred into the cooker, raking a hole in the middle of the pit for it. The coals are then raked around the vessel, and it is covered with embers. The lid is set in place, and carefully covered with dry earth to exclude air from the embers. Four wire handles, with loops in the ends for inserting two sticks, are handy in removing the lid, which is usually quite hot.—Remo A. Parodi, New York, N. Y.



Simple Methods of Muffling the Telephone

The annoying jangle of telephone bells may be easily overcome by moving the bells apart until the tapper scarcely comes in contact with them. This is particularly desirable in offices, or other places, where a loud signal is unnecessary and distracting. A similar effect is obtained by moving the

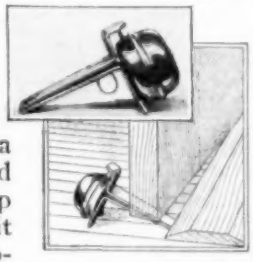
bells close together, so that the tapper is permitted but slight motion. An eraser, or other piece of soft rubber, placed under the edge of one of these bells also muffles it.

Heavy Oil Applied to Fountain Pen Stops Leakage

An application of heavy oil to the joints of a fountain pen will effectively overcome the oozing out of ink at these places. The types of fountain pens, having points which disappear by turning a section of the barrel, sometimes leak because of wear. To remedy this, soak the pen in warm water, and permit it to dry, particularly inside. Then apply oil on the spindle that is revolved. Heavy cylinder oil is best for the purpose. The lubricant should be worked through the bearing from end to end. The pen is then refilled, and excess oil wiped off.

Doorstop Burglar Alarm Made of Bicycle Bell

The burglar alarm shown in the illustration is small enough to be carried in the pocket or grip and will prevent a door from being opened when placed on the floor in the path of the door. Its frame is a wedge spring, and the three sharp points on which it rests prevent slipping. It carries a bicycle bell with clockwork. When the door strikes the alarm, it forces the top strip down, thereby pressing the button, and the bell starts to ring. Even if the door is withdrawn immediately the bell will continue to ring until run down, which takes about two minutes. This is effected by a spring, which is fastened to the top strip, and passes through a slot in the frame. To stop the bell, it is necessary to pull the top strip away from the bell.—A. J. Viken, Waterloo, Iowa.

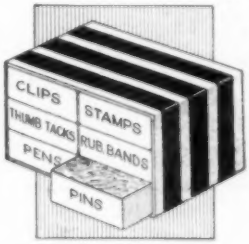


Tennis-Court Marker Inexpensive and Quickly Made

After trying several kinds of markers for the tennis court, a simple homemade arrangement used with a broom and bucket of whitewash, as shown in the photograph, was found practical and inexpensive. The marker was made of two ½ by 4-in. strips of wood, 16 ft. long. The strips were cleated at intervals, so that the opening between them was 1½ in. wide. The tennis-court areas were marked off accurately by setting a line, attached to stakes, along the ground, as a guide for the placing of the marker. The whitewash was applied through the opening in the marker, with a broom trimmed off suitably.

Small Nest of Drawers Made of Paper Boxes

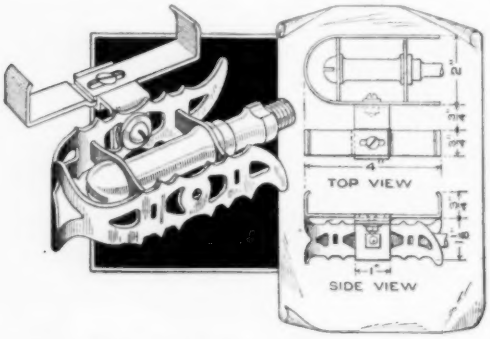
Several cardboard slide boxes were used to make a light, small nest of drawers for use on a desk. The boxes were what are known as "No. 88 slides," measuring ¾ by 2 by 3 in. long. Six boxes, arranged as shown, were glued together and bound with black, gummed paper. The drawers push out from either side. The device proved handy, and this more than made up for the fact that some new boxes were required every six months, or so, to replace the worn



ones. The arrangement has served as a timesaver in the office and the shop. —A. W. MacMillan, Chicago, Ill.

Homemade Bicycle Toe Clips

Bicycle toe clips, which have advantages over many of the manufac-

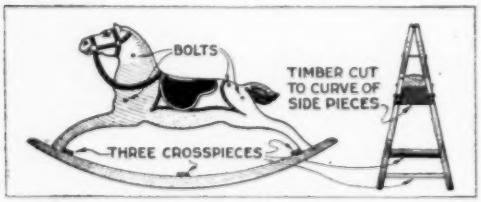


Toe Clips of This Type are Easily Made and Have Advantages over Many Other Kinds

tured varieties, can be made by most cyclists with the use of only a few tools. The toe clip shown in the illustration grips the sole of the shoe and is adjustable to it. It does not chafe the cap of the shoe, and there is no danger of the toe sticking in the clip in an emergency. The device is made of 1/16 by 3/4-in. steel, or even band iron. The two main parts are bent to the shape shown, and provided with slots for adjustment to the width of the sole. Pivotal motion is prevented by the support, which is bent to hold the two pieces which grip the shoe.

Baby's Rocking-Horse Seat Rebuilt as Hobbyhorse

The rocking-horse seat that baby has outgrown can be made into a hob-



Baby's Outgrown Rocking-Horse Seat was Rebuilt into a Strong Hobbyhorse with Only Slight Alterations

byhorse, with only small effort, and material that can easily be obtained. The rocking-horse is taken apart, and the sides left intact. A piece of 4 by 4-in. timber of the proper length is shaped and fitted between the side-pieces, as shown, to form a rounded seat. Three crosspieces are set along the rockers, and the upper portion of the hobbyhorse is strengthened by bolts passing through the sides. Screws are used to fasten the parts together. The seat may be padded, and the horse painted and decorated with suitable trimmings and a bridle. —C. L. Meller, Fargo, N. D.

Rope Wound around Tires Gets Auto Out of Sand

A handy accessory in the tool box of the touring motorist is a length of stout rope. When traction is difficult in sandy country, the rope may be wound around the tires of the rear wheels, passing between the spokes in somewhat the same manner as chains are applied. The rope provides sufficient traction to take the car out of ruts that would ordinarily make shoveling or lifting necessary.—Winnifred K. Stabler, Spokane, Wash.

Window Flag Mounted on Rod from Roller Curtain

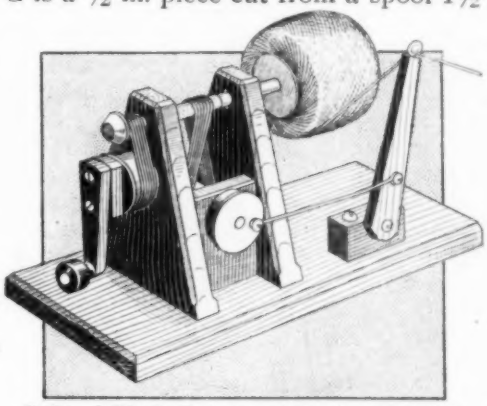
Government stipulations for displaying the national emblem provide that it should not be left unfurled after sundown. A method of placing a flag in a window which permits its easy removal is thus often desirable. Such a flag fastening may be made from an old curtain roller. If the roller is too long, one of the end fittings should be removed and the rod sawed off to the width of the flag. The upper edge of the flag is then tacked to the roller, and the latter placed in the window on the usual brackets, fixed to the sash. The flag may then be easily rolled out of sight or brought into display whenever desired.—Nelson Burns, Buffalo, N. Y.

A Ball-Winding Machine Easily Made

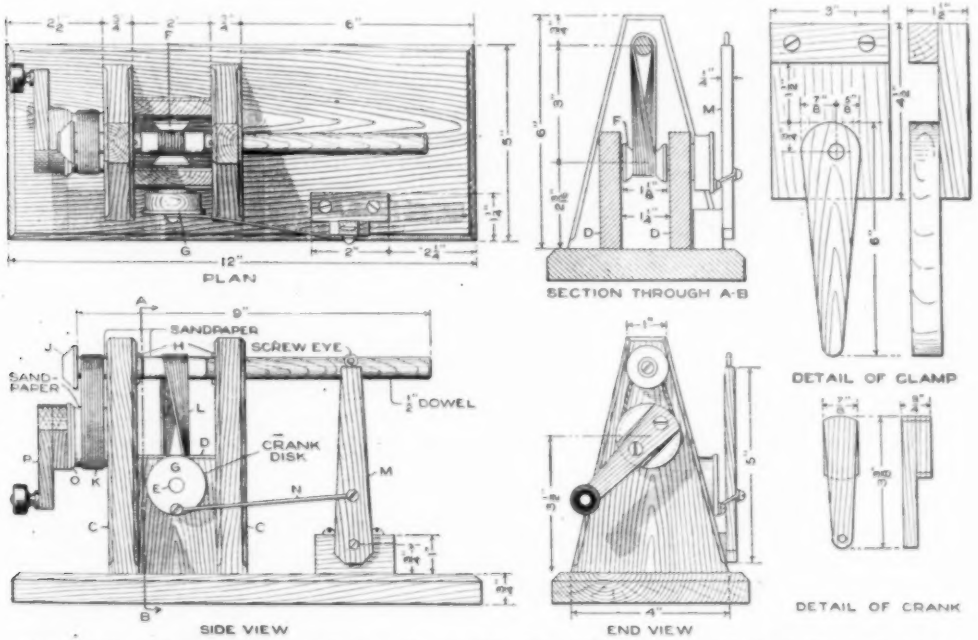
By C. A. BUTTERWORTH

IN winding skeins of yarn into balls, this machine will save much time. Its construction is not difficult, and the materials are easily found in the home workshop. With few exceptions, wood is used throughout in the machine shown in the sketch and detailed in the working drawings. The wool or twine is wound on the ball spindle, as shown, by turning the crank. The thread guide moves gradually from side to side, producing a diagonal winding, by reason of the wire connecting arm, which actuates the guide. This arm is connected to a crank disk set on the countershaft below.

Begin the construction with the base, the two uprights C, and the pieces D which fit between them. Fix the pieces D to the upright C, nearest the handle, placing the shaft E, the spool F, and the crank disk G in position. The shaft is made of a wooden skewer. The spool F is 1⅛ in. long and 9/16 in. in diameter in the center. It should not be over ⅝ in. in diameter, as otherwise the balls will not be wound close enough. The crank disk G is a ½-in. piece cut from a spool 1½ in. in diameter. Put a washer between it and its support. The spool and crank disk are fastened to the shaft by drilling holes through them and using 1-in. brads as pins. A single layer of fine sandpaper is glued around the spool F, to keep the belt from slipping. Fasten the second upright C into place,



Balls of Wool, Twine, and Similar Materials are Wound Neatly and Quickly by Means of This Homemade Winding Machine



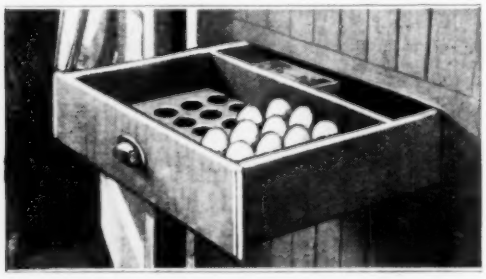
The Details of Construction Are Simple. Nearly All of the Main Parts are Made of Wood; String is Used for the Driving Belts, and the Pulleys are Covered with Sandpaper

and put in the spindle, of ½-in. dowel rod. Two pins, H, hold it in position. A piece of a spool, J, is fastened carefully to the end with a screw to keep the drive belt from slipping off. Sandpaper is glued around the spindle between the uprights, as shown, and at the end where the drive belt K passes over it. The belt L is next put on. This and the drive belt are made of cotton string. Run the string over the spool and spindle about eight times and tie it tightly. Then fasten the uprights to the base with screws, from the underside. The lever M, of ¼-in. wood, is next put on. The connecting rod N is made of 1/16-in. wire. The pulley O is cut from a spool, 1½ in. in diameter, and turns on a screw, 5/16 by 1½ in. long. File the head down to a diameter of ⅜ in., and countersink it. The crank P is made as detailed. The driving belt K is made of 12 turns of string. A good finish for the machine is to rub it down with linseed oil. Shellac is also satisfactory.

To start a ball, run the yarn through the screw eye, and tie the end of it around the center of the spindle. When winding from a reel, the pull of the reel will keep the yarn tight enough to make a good ball; otherwise it will be necessary to run the yarn through the hand to provide sufficient tension. When this is the case, the hardwood clamp, as detailed, will be convenient. Measure the edge of the table on which the clamp will be used, and also the thickness of the base of the machine, and make the clamping space, marked 1½ in. on the drawing, 1/16 in. less than their combined thicknesses. If the clamp does not hold well when the handle is down, put a thin piece of wood, or cardboard, between it and the base of the machine.

Drawer for Butter and Eggs Built into Ice Box

A valuable homemade fixture in the kitchen is a drawer for butter and eggs



The Eggs are Stored in a Cooled Drawer, Conveniently Arranged in a Rack. The Rear Compartment can be Used for Butter and Lard

built into an air-draft cooler, and which can be made even more desirable as a feature of an ice box. The drawer is built so that the articles contained in it are in cold air when the drawer is closed. When the drawer is opened, only a portion of the cold air in it is released, by reason of partitions. These partitions divide the drawer across its width, and extend the full height of the drawer. The photograph shows one such partition, and indicates also how the drawer is not to be pulled out, as the partition should be under the edge of the cooler. The various compartments are arranged to suit the articles contained in them. A wooden tray, with holes, supports the eggs. A slatted bottom is fitted into the compartment for butter and other articles. The drawer should be tightly fitted, and have a front with a shoulder around its edges. White pine, with two coats each of shellac and floor wax inside and out, makes a good material for the drawer.—Henry Simon, Laguna Beach, Calif.

Removing a Broken Caster

A broken caster may be withdrawn from the leg of a piece of furniture by tapping a hole in the center of the caster stem, and threading in a machine screw, thus securing a suitable hold. A heavy metal washer is placed under the head of the screw. One side of the washer is supported by a block of wood, or leather, while a claw hammer, or "jimmy," is used to pry out the broken part.

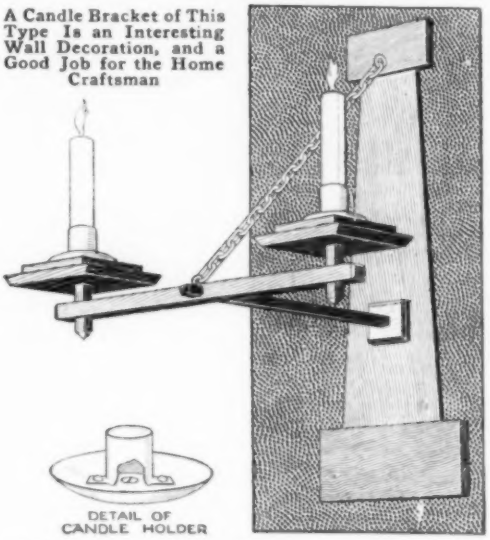
A Wall Candle Bracket with Candlestick Set

By GEORGE W. BRETZ

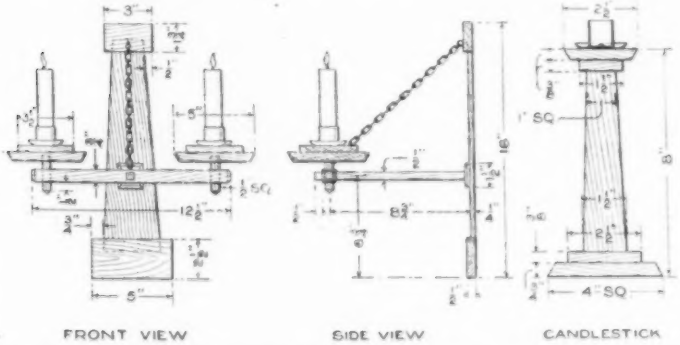
AN interesting piece of wood construction for the home craftsman is a candle bracket, designed to fit a special place on the wall, and provided with two candlesticks to match, where a suitable mantel, shelf, or other support for them, is not available, or desirable. The wall brackets and the candlesticks are finished to harmonize, and fitted with similar candle holders and candles, as well as shades, if desired. Hard wood, or other wood of close grain, should be used, oak being quite suitable. The bracket is supported from the wall by means of screws set through the back piece. A chain of brass or copper, polished or otherwise suitably finished, or a chain of black iron, supports the arm.

Begin the construction by making the back. The panel is mortised into the top and bottom pieces, as detailed in the front view, and the back is 16 in. long, over all. The panel is ¼ in. and the other pieces for the back ½ in. thick. Make the arm ½ in. square and the front crossbar ¾ in. square. The other wooden parts are made as shown.

Make the metal cups of copper or brass, or black sheet iron, if necessary to match the chain. The dish for the candle holder is hammered out from a disk of sheet metal, and the cup formed from a strip, and riveted to the dish. The candle holder is fastened at the center with a screw. Lacquer the metal parts to prevent them from tarnishing quickly. The candlestick, to match the bracket, is made as detailed.



A Candle Bracket of This Type Is an Interesting Wall Decoration, and a Good Job for the Home Craftsman



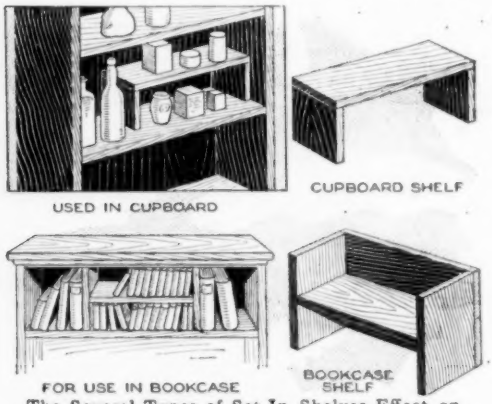
The Construction of the Candle Bracket is Detailed in the Front and Side Views, and the Candlestick is Shown in the Detail Sketch

Novel Method of Ripening Pears

Fancy pears are usually picked before they are fully ripe and are ripened by being spread out in a warm dark room. A better grade of fruit is secured by this method than by ripening on the trees. The coöperation of nature with the artificial agencies of ripening may be secured by the construction of a housing over the entire tree and artificial heating. A tent with an opaque lining serves this purpose. It should be applied at the time the fruit would ordinarily be gathered and a small oil stove installed to keep the temperature above normal. Fine mellowed fruit commanding a high market price is the result.—F. E. Brimmer, Dalton, N. Y.

Cupboard Space Economized by Set-In Shelves

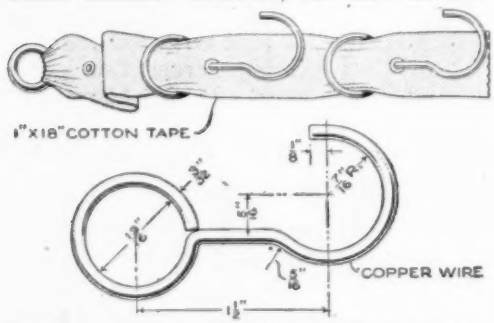
Shelf space in store or home cupboards can be better utilized by providing removable shelves with end supports, as shown in the illustration. They can be made of old boxes, and shorter than the original shelves, so that large bottles, etc., can be set in the higher spaces. Since there are many "pocket editions" published, the method can also be used in bookcases. The wood should match that of the bookcase. If it is placed centrally on a shelf, the device not only increases the capacity of a bookcase, but also improves its appearance, by filling the irregular spaces.



The Several Types of Set-In Shelves Effect an Economy of Space in the Larger Shelves

Hooks Attached to Tape for Travel or Camp Use

To provide a hanger for clothes and other smaller articles, for use in the home as well as in the camp during the camping season, I arranged a series of hooks on strong cotton tape as shown. The device proved useful, especially in traveling, as the tape with the hooks can be easily folded into small space. The hooks were made of $\frac{3}{32}$-in. copper wire; as detailed in the sketch. Eyelets were set into the tape, but these are not essential.—L. B. Lawrence, Louisville, Ky.



Hooks Arranged on a Suitable Tape Are Convenient for the Traveler as Well as for Home Use

Utilizing Waste Photographic Materials in the Workroom

The amount of waste materials in photography is often unduly large, and a few hints in economizing the odds and ends will aid in effecting a saving. Cover glasses for lantern slides may be made from negatives after the films have been cleaned off. The film on negatives is difficult to clean off, if it is permitted to dry. Hence, spoiled negatives should be placed in a dish with warm water as soon as they are rejected. The film quickly washes away.

Negatives that are of no use as photographs may easily be converted into diagram slides. As soon as it is realized that the negative is a bad one, expose it to the full light so that it completely blackens. Then, with a needle pushed in a penholder, work out the white lines.

Much printing paper is thrown away from time to time because it is too dark or too light. This is worth preserving by those who make use of a combined bath for toning and fixing. Bits of printing-out paper, or any kind of silver paper, placed in the bath before the good prints are put in, will have a valuable effect in starting the toning action. Damaged mat-surface paper, bromide or platinotype, should be allowed to become perfectly black. In this way a dead surface is secured, and such paper is often useful. A desirable feature of this blackened printing paper is that it can be used like mucilage paper, owing to the gelatin on it.—S. Leonard Bastin, Bournemouth, England.

Bottle of Hot Water Removes Splinter from Hand

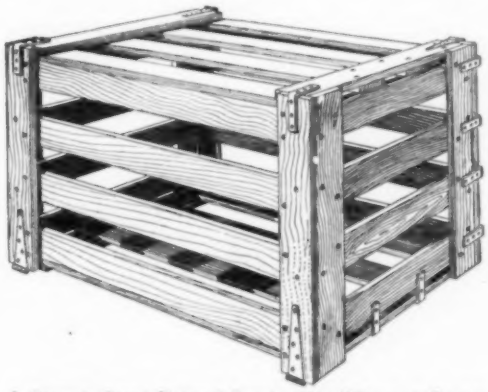
To remove a splinter from the hand, fill a wide-mouthed bottle nearly full of hot water. Thrust the injured part over the mouth and press it slightly. The flesh will be drawn down, and shortly the splinter will be exposed under the action of the steam. This method is far better than the common and dangerous practice of pricking the flesh with a pin or knife point. The usual antiseptic solution should be applied.—R. Kirkpatrick, Washington, District of Columbia.

Ordinary Ink-Bottle Corks Fitted with Pen Fillers

An economy in expensive drawing ink, ordinarily used with a ruling pen, was effected by substituting common writing ink for the drawing ink on many kinds of work in which permanence is not a special factor. A convenience, in using this substitute ink in the ordinary containers, is to insert a pen point, by the pointed end, into the bottle cork. This provides a handy ruling-pen filler, similar to the usual quill stoppers.—F. M. Ball, Kansas City, Mo.

A Strong Crate for Trunk in Shipment

In making use of a trunk for frequent heavy shipments over a short distance, and sometimes by freight, a crate like that shown in the sketch saved much wear. It is made of 4 by ⅞-in. ash, put together with carriage bolts and screws. The top and front are hinged so that they can be opened and the trunk taken out. The amount of lumber required depends on the size of the trunk. For a small trunk only three side strips are needed. Make the back and sides first. The corner pieces are bolted to the side-pieces so that they project ⅞ in. Place the bolt heads on the inside, and countersink them as well as the nuts and washers. The sides are fastened to the back with angle irons and riveted bolts. Fasten the bottom to the sides and back with angle irons. The top

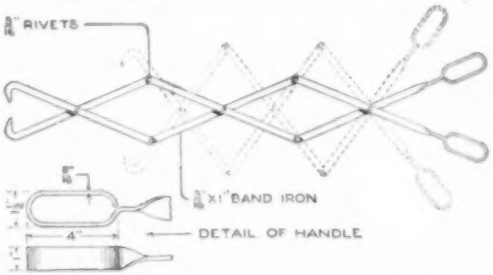


A Strong Crate Proved Serviceable Where a Trunk was Subjected to Unusually Heavy Loads and Severe Wear

and front are hinged with 8-in. strap hinges. Cut the pieces for the top the same as those for the bottom. When measuring the trunk, all projections must be allowed for. To open the crate, remove the screws holding the angle irons to the top.—Clifford A. Butterworth, Newton Centre, Mass.

Tongs for Removing Clinkers from Furnace

The householder who has attempted to remove clinkers from a furnace with a poker will appreciate these home-made tongs for the purpose. They fold compactly when not in use, and are long enough to give the needed protection to the user. They are made of 3/16 by 1-in. band iron, two strips being shaped to form the handles, as

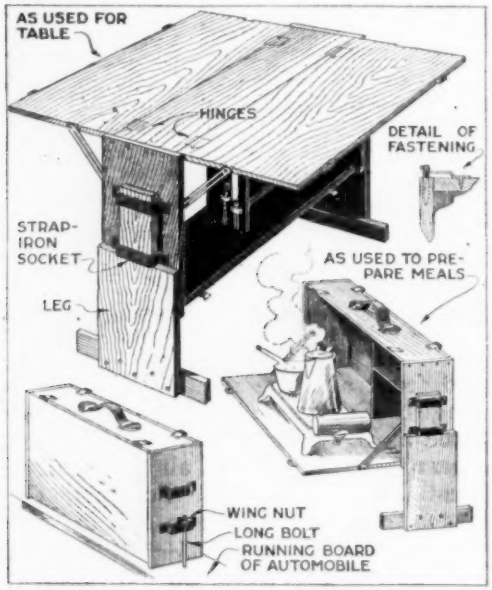


This Substantial Pair of Tongs Is Handy in Removing Clinkers from the Furnace Fire

detailed. The joints are riveted snugly, but with sufficient play.—A. E. West, Detroit, Mich.

Combination Lunch Kit and Table for Autoists and Campers

Campers, motorists, and others who appreciate a convenient table for



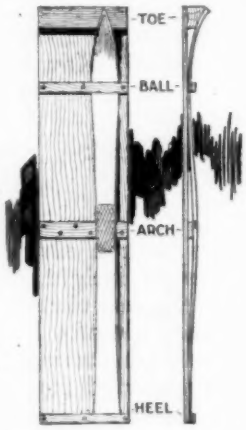
The Table Folds Compactly to the Size of an Ordinary Suitcase, and Provides for Tableware and Food Storage

luncheon when on the road, or at a temporary camp, will find the home-made arrangement shown in the illustration especially convenient. When being transported, on the running board of the car, or otherwise, the outfit is folded compactly, and is bolted to the running board, as detailed. When used in the preparation of food, one side only is lowered and the outfit set up as shown. For the serving of food, or for other uses to which a small table is put, both sides are folded out, and set on the supporting braces. The interior is partitioned, and provides for the usual tableware, as well as food storage. A leather handle provides for carrying the outfit. After the meal has been prepared, the supporting pieces are withdrawn from the iron strap and reversed, bringing the open side panels into position as table leaves.

Poplar, or other light, soft wood is suitable for the construction. Cross-veneered stuff is especially desirable, because of its strength and lightness. The joints can be nailed securely, or fastened with dovetail joints, if an especially good job is desired. Suitable dimensions for the case are 6½ in. wide, 15½ in. high, and 25 in. long, when folded. This gives a table height of 27 in., and a table top of 25 by 37 in., making provision for from four to six persons. Unless several-ply stock is used, the wood should be ¾ in. thick. The supports for the top are provided with bolts with wing nuts, so that the braces can be clamped securely. Metal catches hold the side panels at the top, when the case is folded, as shown in the detail of the fastening. Finish the case inside and out with two coats of spar varnish, to withstand exposure.—G. A. Luers, Washington, D. C.

Preserving Shape of Skis between Seasons

Skis should be carefully mounted in a suitable frame to preserve their shape between seasons. A method that will do the work satisfactorily, and which it will pay the owner of a good pair of skis to adopt, is shown in the sketch. A frame of suitable length is made of a board, or several boards, cleated together as indicated. Blocks of the proper height are fastened across the frame to give the skis the correct curve. The heel of the ski fits under the end cleat, the center over a cleat, and the ball under a narrow strip. The toe rests on a thick block. The skis in the frame are set in a dry place and protected from dirt by a suitable cover, painted canvas being desirable for this purpose.—Christian Weyand, Buffalo, New York.



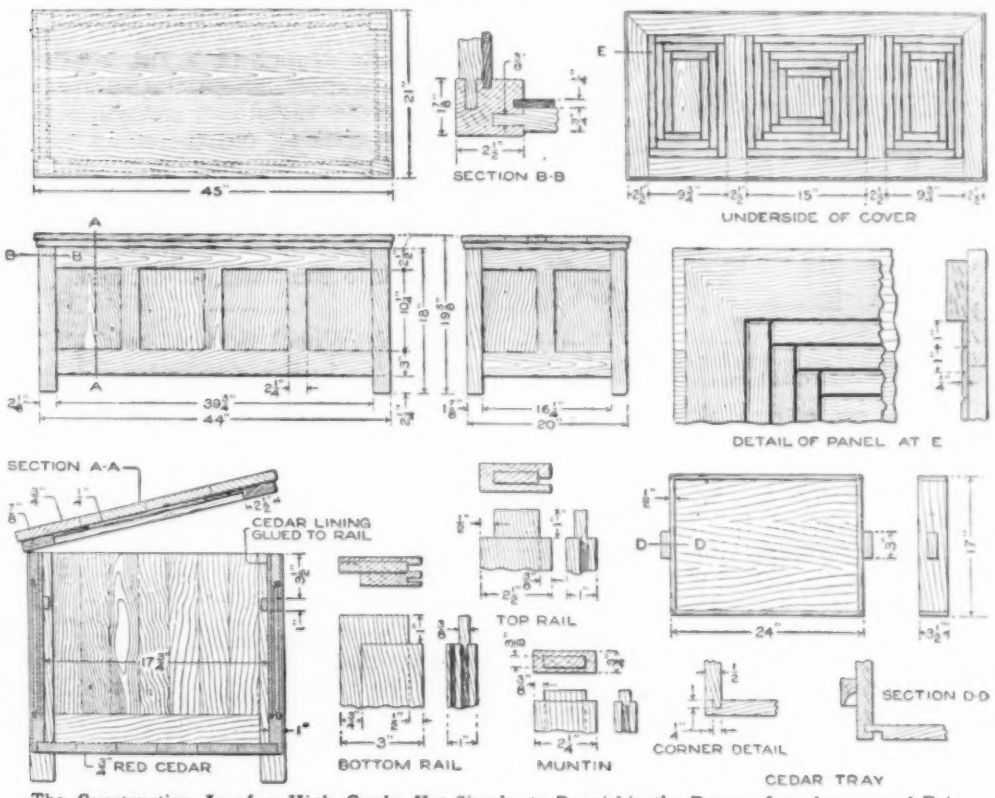
A Cedar-Lined Oak Chest

By JOSEPH T. SPROULE

WOOLEN garments, furs, and other clothing placed in a cedar chest, will be protected against moths, and an ideal combination is the use of oak for surface finish and red cedar for the lining of such a piece of furniture. The oak matches with many other pieces and gives a good cabinet effect. The chest shown in the photograph, and detailed in the working drawings, was built of quarter-sawed oak and lined with red cedar. The construction is clearly shown, and the home mechanic of fair skill can master the job, if a few important suggestions as to the general process of building are followed.

The posts are made first; then the rails, muntins, and panels. Next, handplane, scrape, and sandpaper all the surfaces that show. See that all joints "come up" well. The front and back may then be glued up, and the ends glued in later. The red-cedar bottom, which is made of several pieces glued together, is fitted and fastened with

This Elegant Paneled Oak Chest is Lined with Red Cedar, Combining the Protective Qualities of the Cedar with the Cabinet Finish of the Quarter-Sawed Hard Wood



The Construction Is of a High Grade, Yet Simple, to Be within the Range of an Amateur of Fair Skill. The Details of the Various Parts, as Shown, should be Observed Carefully

screws into the bottom rails. After this has been done, cut and fit the ¼-in. lining, so that it will just fit into the rabbets in the posts and bottom rails. Glue it only to the top rail, thus leaving the other edges free to shrink or swell.

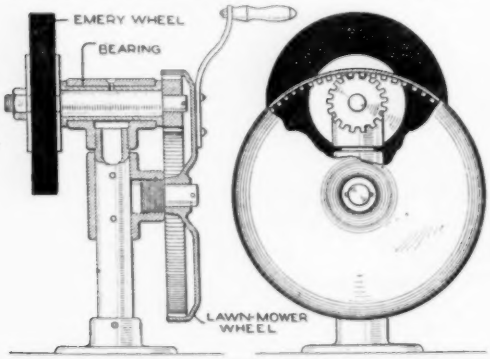
The cover, which is of quarter-sawed oak, may be made next, or as is convenient. The two long pieces of the underframe are glued fast to the cover, while the crosspieces are fastened with countersunk screws, the heads of which are covered with oak plugs.

The three panels on the underside of the cover may now be inlaid. The inlaying is of red-cedar strips, beveled on the edges and ends, as shown in the view of the underside of the cover and in the cover detail. The cover is hinged to the chest with three special chest hinges. It is prevented from opening too far by means of a chain. The half tray is made of cedar and rests on two cedar strips glued and nailed on either side of the lining.

After the chest has been cleaned, scraped, and sanded well, it is ready for the finish, which may be in various stains, natural and in wax, or rubbed varnish. A good plan is to match the other furniture in the room where the chest is used. The oak should be filled to produce the best surface for finishing.

Emery-Wheel Grinder Driven with Lawn-Mower Gears

A substantial and practical emery-wheel grinder, to be set on the work-bench, or on a special support, was made as shown, with gears from a lawn mower to transmit the power from the hand crank. The pinion, meshing inside of the internal gear, which was formerly the lawn-mower wheel, is set on a steel shaft, provided with a shoulder to receive the pinion. The opposite end of the shaft is shouldered and threaded to hold the emery wheel between washers and a nut. A steel pin holds the pinion on the shaft. The standard was built of a length of pipe and suitable fittings. A tee was used for the bearing, babbitt being cast into it in the usual manner. The bearings were provided with suitable oil holes, and the support riveted at the joints in the fittings, to insure stability.



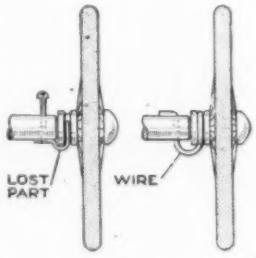
This Substantial Emery-Wheel Grinder was Made of Pipe Fittings and Parts from an Old Lawn Mower

Handy Container for Tacks

By cutting a small, triangular opening in one corner of a tin, or cardboard, box containing tacks, screws, or nails, time is saved and annoyance obviated in shaking out the small quantity desired. The opening should be only large enough to permit the pouring out of a few of the articles at a time, so that one or more can be poured into the hand, as desired.

Baby-Cab Wheel Secured with Wire in Emergency

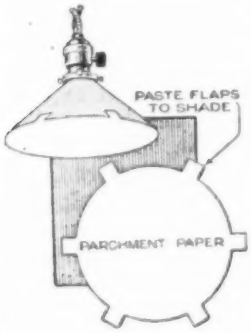
The small spring hook that held the wheel in place on the end of the axle of baby's buggy, was lost, and the replacing of the parts meant considerable delay. A hasty repair was made, and proved so satisfactory that it lasted for a considerable time. A short piece of wire was bent, as shown in the sketch, to fit through a hole in the axle and curl around



the groove in the hub of the wheel. The wire was first fitted around the hub and then bent into a U-shape. The straight end of the "U" was put through the hole and its upper projecting end was bent to form a shoulder. The loop around the hub was then secured sufficiently to hold the wheel. The part was oiled slightly, as usual.—R. H. Cawood, Cleveland, Ohio.

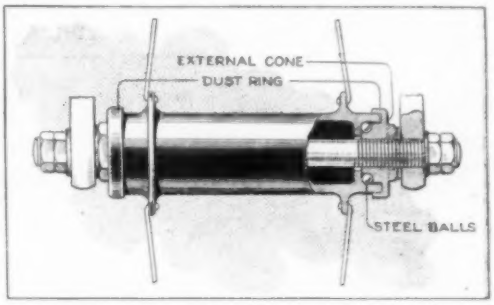
Paper Bottom on Light Shade Overcomes Glare

For detail work requiring a good light, I sometimes find it necessary to use a desk lamp. Direct rays from an incandescent light cause a disagreeable glare on papers or drawings, which tires the eyes. I have found relief by covering the opening in the shade of an ordinary desk droplight with a disk of thin parchment paper. This breaks up the direct rays, permitting only a soft diffused light to fall on the work, causing no annoyance nor injury to the eyes.—K. M. Coggeshall, Webster Groves, Mo.



Broken Bearing in Motorcycle Wheel Quickly Repaired in Contest

A motorcyclist, participating in an endurance contest, was apparently put out of the running near the finish by the breaking of the ball races and steel balls of the front-wheel bearing. An inspection showed that these parts were damaged beyond repair at the roadside, and chance for success in the contest depended on an immediate remedy. The broken parts were, therefore, removed, and the cones locked into the hub, and set tightly by means of the nuts at the end, as shown in the illustration. The wheel revolved with the axle inside of the fork rocker arms. The friction was reduced by the plentiful use of grease, and the

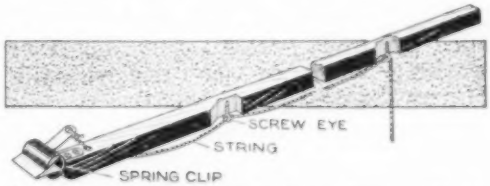


When the Ball-Bearing Fittings were Put Out of Commission, in a Contest, an Effective Roadside Repair was Quickly Made

contest was finished under this substitute repair. The 22 miles to the finish line were completed without further difficulty, and with the score of the cyclist unimpaired. No material damage was caused, either to the axle or the fork and connections.—John E. Hogg, Alhambra, Calif.

Spring Clip Rigged as Handy Pick-Up Tool

In working around machinery, it is often inconvenient to get at small parts, refuse, and other objects which fall into out-of-the-way places. A device which proved effective under these conditions consists of an ordinary spring clip, arranged on the end of a wooden rod and controlled by means of a string threaded through screw eyes, set along the rod as shown. The clip is thrust into the place difficult of access, and the object is grasped with the clip, first opening it

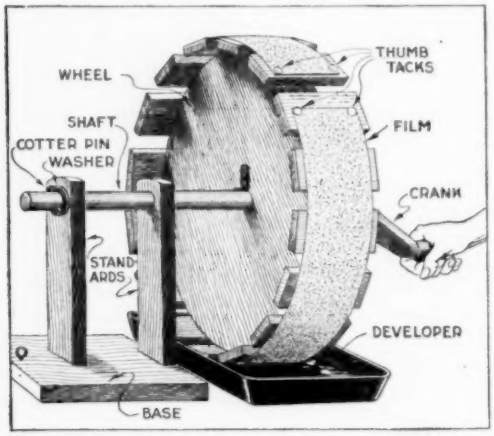


Machine Parts and Small Tools are Removed Easily from Places Difficult of Access, by Means of This Improvised Tool

by pulling on the string and then releasing the latter.—Stanley J. Harazim, New York, N. Y.

Revolving Drum for Developing Roll Films

A homemade device, which is useful for developing roll films, is a drum on



Much Time is Saved and the Work of Developing Roll Films Made Easier by the Use of This Drum Arrangement

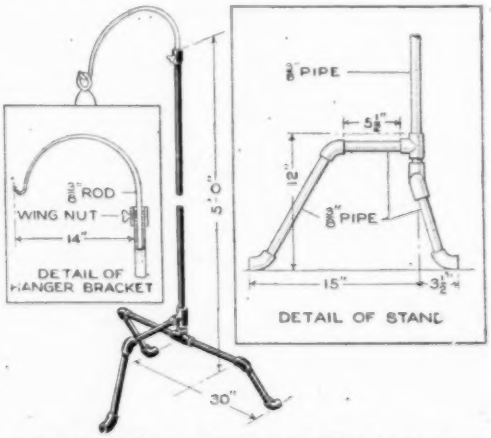
which the film is stretched and revolved, as shown. A 12-in. disk of 7/8-in. soft wood supports the small strips around its circumference. The strips should be made slightly wider than the largest film to be placed on the drum. The disk is mounted on a shaft, which is carried by a wooden support set on a suitable base. The support and base should be just high enough so that the film, revolved on the drum, barely dips into the developer. Developing with this device as an aid saves staining the hands and is not tiresome. When the film is developed, a tray of water is set under the drum and the film is washed in about a minute or less. A tray of hypo fixing bath is then set under the drum and the film fixed. The film does not curl by this method, and the final washing may also be done with the film on the drum.

Cardboard Disk Guards Flash Light Packed in Baggage

By unscrewing the battery cap of a pocket flash light and placing a cardboard disk between the end of the battery and the contact spring, accidental switching on of the light may be avoided. This is especially useful when the flash light is being carried in a traveling bag. When the flash light is to be lighted, or the guard is unnecessary, the disk can be removed easily. —W. S. Wilson, Cascades, Quebec, Canada.

A Bird-Cage Stand Made of Pipes and Fittings

It is desirable that the pet canary, or other bird, usually kept indoors, be moved from place to place so that plenty of light and sunshine is afforded, and this can best be done by suspending the cage from a portable stand. Such a device was made of pipes and fittings, as shown, and proved serviceable and neat in appearance. The base is arranged in triangular form, so that the stand can be set close to a window or wall. The curved bracket is made of 3/8-in. iron rod, and slides in the top of the main pipe, as detailed. It is set by means of a wing nut. The base of the stand is built up of short sections of pipe with fittings, as shown. The angles at the floor should be plugged, and polished smooth, so as to slide easily over rugs, or on the floor. When the work of fitting the pieces together is complete,



A Stand for the Pet Bird can be Made in the Home Workshop of Pipes and Fittings

the stand should be wiped clean and finished with aluminum or gold-bronze paint.

How to Construct a Remagnetizer

TWO electromagnets mounted on an iron base, their upper ends provided with suitable pole pieces, form the remagnetizer shown in Fig. 1.

The two coils may be constructed as follows: Procure two pieces of brass tube 9⅛ in. long, 2 in. in outside diameter, and about 1/16 in. in thickness of wall. Cut four circular pieces 4 in. in diameter, from ⅛-in. sheet brass, and then cut an opening in the center of each so that they will just slip on the ends of the brass tubes. Next cut four circular pieces, 5¼ in. in diameter, of ⅛-in. fiber, and also cut a similar opening in the center of each of these. Square off the ends of the tubes so that the latter are 9 in. long, and braze, or solder, with hard solder, one of the metal pieces on one end of each tube. Then slip the fiber pieces into place on the tubes, placing two on each, and solder the remaining two metal pieces on the other ends of the tubes.

The terminals for the winding may be made as shown in Fig. 3. Obtain four pieces of brass ⅜ by ⅜ by 1 in. Two of the pieces should be mounted diametrically opposite each other on the inside surface of one of the fiber washers on each spool, and as near the edge as possible. Drill two small holes through the fiber washer, where the terminal is to be mounted, and countersink the latter on the outside surface to accommodate two flat-head, brass machine screws. Drill two holes almost through each piece of brass to correspond to the holes in the piece of fiber, on which it is to be mounted, and thread them for the mounting screws. Drill two small holes radially and almost through each piece, as shown in Fig. 3, so that one opens toward the center of the spool and the other away from the center. Then drill two holes in the upper surface of each piece to meet the radial holes; thread each of these holes for small screws. Cut a 1/16-in. groove in the inside surface of each of the fiber pieces, from one of the radial holes opening toward the center in each of the terminal pieces, toward the center of the spool.

Procure 6,800 ft. of No. 18 gauge, double cotton-covered copper wire,

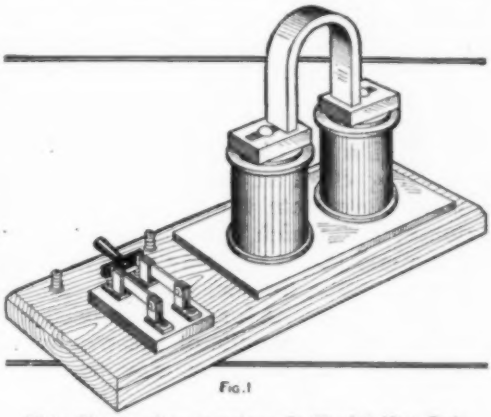
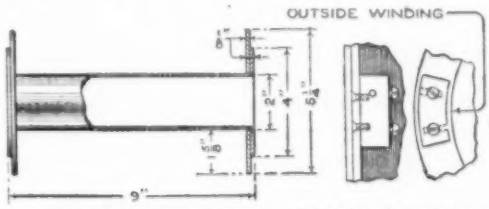


FIG. 1

This Simple Remagnetizer Is Useful Not Only in the Electrical Laboratory but Also for the Experimenter in Practical Electricity

and divide it into two equal parts. Wrap two layers of insulating cloth around each of the brass tubes, shellacking them thoroughly. Cut four washers, from the same kind of cloth, 5 in. in outside diameter, and having an opening 2 in. in diameter. Split the washers so that they may be placed over the tubes. Place two washers on each spool. Mark the terminal blocks, and remove them from the fiber pieces. Mount the spool in a lathe or winding machine and proceed as follows: Lay the end of the wire in the



SPOOL FOR WINDING
FIG. 2

TERMINAL FOR WINDING
FIG. 3

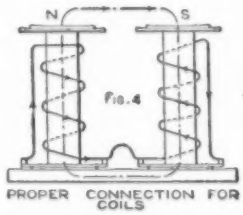


FIG. 4

PROPER CONNECTION FOR COILS

The Details of Construction must be Followed Carefully in Order to Obtain Satisfactory Results

groove in the piece of fiber, allowing 2 or 3 inches to extend beyond the outer edge; place both cloth washers up against the inside surface of the fiber washer, and, if necessary, shellac them into place. Wind on three or four layers, place a layer of insulating cloth around the spool, and continue until all the wire is used, inserting insulating cloth at least every fourth layer. Terminate the winding at the same end at which it was started, and tie the end down securely with strong linen thread. Solder a short piece of stranded conductor, such as used in lamp cord, to the ends of the winding. The completed winding may be covered with friction tape. After the winding is completed, the terminal blocks may be remounted and connected to the terminals of the winding.

The cores of the two coils may be made from a good grade of wrought iron or cast steel. They should be 9⅛ in. long and have an outside diameter such that they will just slip into the brass tubes. Drill a hole in the center of each end of both pieces and tap them to take a ⅜-in. machine screw. A piece of wrought iron or cast steel, about 1 in. thick, 6 in. wide, and 12 in. long, forms the base of the electromagnet.

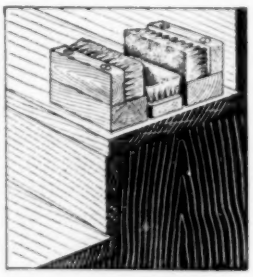
Obtain two pieces of wrought iron or steel, 1 in. thick, 3 in. wide and 4 in. long, which are to serve as the pole pieces, and are to be mounted on the upper end of the field cores. Cut a ⅜-in. slot into each of these pieces, to adjust the pole pieces to almost any size of magnet. Mount the completed electromagnet on a heavy wooden base.

The two upper jaws of the switch should be connected to the binding posts, and the two jaws in which the blades of the switch are mounted should be connected to the terminals of the winding on the electromagnet. The windings on the two spools are to be connected in series in such a way that the current in both will tend to produce a magnetic field around the magnetic circuit in the same direction as shown in Fig. 4. The winding described above is to operate on a 110-volt direct-current circuit and should take about 250 watts.

When the electromagnet is complete, the remagnetizing of a magnet is performed as follows: First adjust the distance between the inside ends of the pole pieces to correspond to the distance between the inside surfaces of the ends of the magnet to be magnetized. Test the polarity of both the electromagnet and the permanent magnet by means of a compass needle and place the magnet in position on the pole pieces as shown in Fig. 1, with the north pole of the permanent magnet in contact with the south pole of the electromagnet on one side and the south pole of the permanent magnet in contact with the north pole of the electromagnet on the other side. Turn on the current and rock the permanent magnet back and forth a number of times, continuing the operation for several minutes. Place a piece of flat iron across the end of the permanent magnet when it is in a horizontal position and pull it off the electromagnet.

Scrub Brushes Mounted as Shoe Cleaner

A homemade shoe cleaner, which met with the hearty approval of the housewife, was made of scrub brushes, trimmed off and mounted at the edge of the stairs, as shown in the sketch. Stiff bristle brushes, one wide and the other two narrow, were used. One edge of each of the latter was trimmed off, as indicated, and the brushes were mounted on blocks, with screws. The other brush was fastened to the tread, between the mounted brushes. The shoes are, of course, given a preliminary cleaning if heavily loaded with mud.—J. S. Hand, Chicago, Ill.

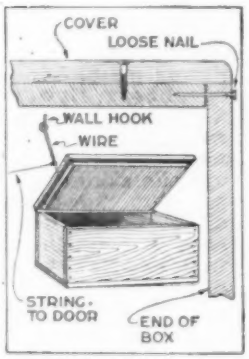


Couch Hammock Improved by Strips to Support Cushions

Lounging in a canvas garden swing, or couch hammock, sometimes becomes uncomfortable because the canvas at the back bulges, affording little support. I overcame this difficulty by fitting in a wooden lateral slat, to reinforce the back. The slat is inserted in canvas slots provided for it, and the ends are permitted to extend 2 in. beyond the supporting chains. The slat may also be lashed into position with cords. The seat cushions can be used as conveniently against the slat as in a more substantial chair or sofa.—J. G. Pratt, Washington, D. C.

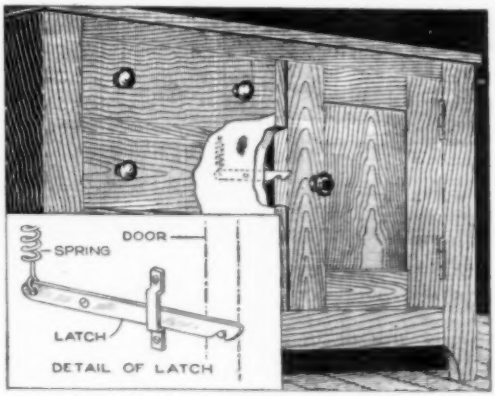
Box with Drop-Lid Device Protects Photographic Negatives

Spoiling of undeveloped films in the photographic dark room, by reason of the careless opening of the door, may be largely overcome by the use of a box with a lid closing automatically when the door is disturbed. As the films, for example, are stripped of their protecting paper and marked, they are deposited in the box. The cover is only half open, and is held in this position by a hook connected with a cord, the end of which is coiled around the door knob. When the knob is turned, winding the cord, the hook is withdrawn, and the lid instantly closes. As an additional precaution, the films are locked in the box, ordinarily, by means of a nail inserted through a hole in the end of the box, near the top, and engaging the cover on the inside. The nail, being almost invisible, prevents the opening of the box by persons unfamiliar with the method of locking.



A Meddle-Proof Latch for Drawers and Cupboards

Youngsters in the home often meddle with drawers and cupboards, and

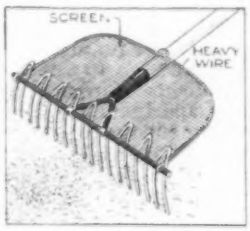


The Latch Is So Inconspicuous That Youngsters and Others Are Not Likely to Disturb It

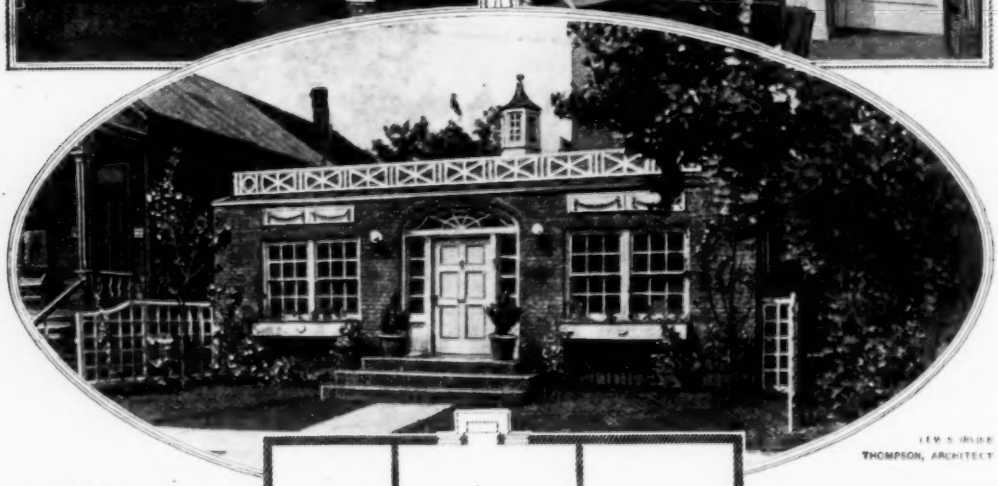
where it is not desirable to fit these with locks, some form of latch is convenient. One that is easy to make and so inconspicuous that it is seldom meddled with, is shown in the sketch. It can be fitted to doors as well as drawers. The main piece is made of a strip of iron, and the strap, which holds it, is bent from a smaller strip. A spring gives the latch the proper tension, engaging the bar over a pin.

Screen-Wire Guard for Lawn Rake

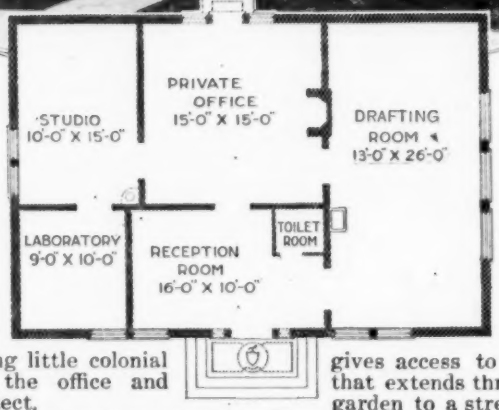
Even when there is little or no wind, dry grass and leaves are difficult to rake with one operation because some of the driest particles usually spring over the rake. This difficulty may be prevented by fitting a wire-screen guard to the rake as illustrated. With this simple attachment a clean path is left with each raking operation, and when the pile gets large the tendency of the material to roll over the rake is overcome.



OFFICE-STUDIO BUILDING OF QUAINT DIGNITY



LEW S. IRISH
THOMPSON, ARCHITECT



OCCASIONALLY a designer's originality finds expression in something intended for his own use. And at times such works are divorced from usualness by fresh touches that give them distinctiveness and interest. Such is the case at Portland, Ore., where there is a pleasing little colonial building that houses the office and studio of a local architect.

It is a low, one-story structure of red brick and white trim possessing quiet refinement and dignity. Here and there it has ornamental features that bear close similarity in design to corresponding appurtenances at Mount Vernon. Evidences of this are particularly noticeable in the white parapet railing and the cupola, outside, and the mantelpiece in the office. These adaptations from Washington's home have the merit of merging harmoniously with the general scheme and at the same time lending an atmosphere so strikingly familiar that at first it is somewhat bewildering.

The structure is set at a discreet distance from the sidewalk and enhanced by a small grass plot, some shrubbery, flower-filled window boxes, and low, white trellises that border the opposite sides of the property. The depth of the lot has made possible a delightful surprise at the rear. A paneled doorway gives access to a narrow gravel path that extends through a pleasing formal garden to a stretch of lawn that is set with artistic benches and equipped with a clock golf green.

Presented above is a floor plan that explains adequately the interior arrangement of the structure. The drafting room, provided with three broad windows before which the tables are placed, occupies the north side of the building. A skylight supplies proper illumination for the owner's private studio, situated at the opposite side. The building represents an investment of about $2,500 in material and labor. In designing it, structural provisions were made to facilitate its removal intact, should conditions eventually make such a procedure advisable.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]